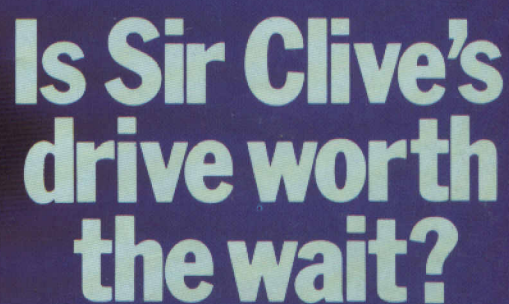


COMPUTER NEWS

NEWS

THE COMPLETE COMPUTING WEEKLY



ATARI IN ACTION

ATARI IN ACTION

Zap, splat and blast-em games

TANDY ON TRIAL

TANDY ON TRIAL

Pro-Test of the Model 4

SORD'S SOFT EDGE
...er sound and graphics

SORD'S SOFT EDGE
Sharper sound and graphics
control with Basic-G

BBC MICROFLOPPIES
of the new 3-inch drives

BBC MICROFLOPPY

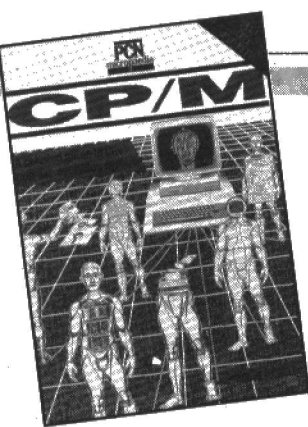
Full test of the new 3-inch drives

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Free software is only a few key-presses away

PCN MICROPAEDIA
 ... and keep to build library

PCN MICROPALETTES
Pull out and keep to build
your microcomputing library



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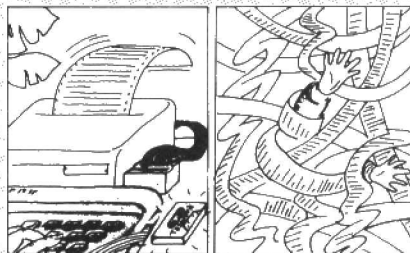
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Apple lashes mimics

Apple is out to pick off its rival look-alikes, and the company has just brought down an injunction on Sirtel halting imports and sales of the Micro-Professor II. And the move could leave MPF-II dealers with stocks on their hands.

Peter Cobb, Apple UK's managing director, said the company is busy examining micros that advertise themselves as Apple-like machines, 'as we find people advertising these micros, and if we deem them to be look-alikes, and infringing our rights, we request the distributors to stop handling them,' said Mr Cobb. 'Sirtel is the first UK company to decide to carry on handling the micro in any case.'

The High Court has ordered that Peterborough-based electronics importer Sirtel should stop importing, advertising and dealing in the MPF-II, which has an architecture similar to the Apple's, will run some

**PCN PRO-TEST
HARDWARE**

The MPF II claims Apple compatibility colour and 64K RAM Christopher M.

Micro Professor —oriental Apple?

The Micro-Professor (MPF) II is a product of Taiwan, or more correctly, the Multitech Industrial Corporation. It is not a new machine. Multitech launched it in the US two years ago, and it comes in Britain with a reputation for offering an architecture very like the Apple's, but for much lower price.

The difference between the two machines is great that Multitech has been able to pay Apple a fee for the 'Micro-Professor' name.

and informative. It includes a listing of the monitor program, which is good news for machine code fans.

The programme manual attempts to serve user-friendly notice. It is cluttered with cartoons, none of which contributes much to the text.

One drawing has a remarkable caption, in order to comprehend human behaviour, please look at the following picture. The picture shows...

The Micro-Professor is badly affected by fluctuations in the power supply, which do not cause the flicker most hardware users would expect.

At a price of £199, the content of ROM is...

PCN's Pro-Test of the MPF-II in issue 9: obvious similarities to Apple.

Apple software, and uses an almost identical Basic. Sirtel has also been stopped from sending its stocks of the micro back to Multitech Corporation, which manufactures the micro in Taiwan, until the case comes to trial.

But Richard Drewnicki, Sirtel UK's managing director, says Sirtel will fight the case. He could not reveal on what grounds the company will do this, but it is likely to be that the software is not similar enough to constitute a true look-

alike. 'Existing users will be given full support,' Mr Drewnicki also promised.

According to Mr Cobb, the Apple Corporation's policy worldwide is to take action in individual countries against suppliers of Apple imitators. The company has stopped the Apollo micro in this country, along with various others, says Mr Cobb, while in the USA a Californian court upheld Apple's right to claim copyright on software resident in ROM, in a case against the Pineapple.

Other distributors of Apple-like micros could be on the wrong end of Apple action, too.

'There have been several cases, but most of the distributors have taken our word that their product infringes our rights—chiefly on the grounds of software similarity,' he told PCN. 'But there are a number of cases still outstanding.'

Torch regroups

Torch Computer's deal with electronics giant GEC has collapsed (PCN, Issue 20) but the upheavals at Torch seem to be over.

Under the terms of the heads of agreement, GEC was to buy 76 per cent of Torch in exchange for a £3.25 million cash injection. A proportion of this was to buy out the existing shareholders. The remainder was to finance product development and manufacture.

Apparently it was GEC which ended the negotiations. Its reasons are unclear.

However, it has been suggested that the company wanted to increase its shareholding to 100 per cent, turning Torch into a wholly owned subsidiary. This was unacceptable to Torch and many of its staff, who have said that the reason they joined Torch was because it was a young, independent and innovative company.

Following the collapse in the talks with GEC, Torch has gone

back to its original shareholders, Newmarket (Venture Capital), the Welsh Development Agency and Bell Nominees. Their offer to inject a further £1 million into the company has now been taken up.

Two casualties of the re-financing are Martin Vlieland-Boddy and Peter Harris, the original founders of Torch. Mr Vlieland-Boddy has resigned as chairman and has left the company. Mr Harris has resigned as managing director although he remains a member of the board.

In their places come Robert Gilkes as chairman and joint managing director and Guy Neely as the other joint managing director. Mr Gilkes was formerly managing director of UCSL Micro Systems, a Unilever microcomputer manufacturing subsidiary. Mr Neely was until recently financial director of Glaxo Holdings, the food and drugs conglomerate.

megabyte add-on memory board for the PC which has a set of concurrency software routines included, to fit on top of Microsoft's PC DOS.

Encotel isn't yet ready to ship the board, which comes from Profit Systems in Chicago, and will sell for £455. But it will reportedly allow up to nine jobs to be run at the same time on the IBM PC, although PC DOS itself is a single-tasking operating system.

Digital Research is also making moves to capture a slice of the Lisa/VisiOn operating environment market, with a product called VIP now under development. More details in next week's PCN.

Concurrent CP/M-86 now on IBM PC

IBM PC users should soon be able to take their pick of concurrent operating systems for the machine, choosing between the two arch-rivals Digital Research and Microsoft.

Digital Research is now shipping Concurrent CP/M-86 at £226 for the top-of-the-range hard disk version of the IBM micro—the PC XT. And Encotel is importing a half-

Business micros in 16-bit battle

A gruelling public test of 16-bit business micros was due to get under way at noon yesterday (Wednesday).

The London Computer Marathon will pit 14 systems against each other, against the clock, and against a processing trial scheduled to last one week. It is being held at the boardroom of the World Trade Centre in London, and will be judged by PCN and Which Computer.

MicroNetworks, which threw down the gauntlet to the other

manufacturers, has entered its Samurai. Olivetti, Wang, Triumph-Adler, LSI and Comart have accepted the challenge, and the field will include a privately entered IBM PC.

The testing procedure will run until noon on Wednesday of next week, 24 hours a day, and at the end, the number of complete cycles of a test-program and the count of errors will be announced.

Most of the machines are pseudo-16-bit machines running the 8088 or 8086 chips, though the Olivetti uses a Zilog Z8001, a true 16-bit chip, and all have at least 128K RAM and two floppy disk-drives.

PCN will have a progress report next week. The final results will be announced at the end of the test, on Wednesday, August 17.

Dragon bypass

By Geof Wheelwright

Dragon users losing patience in the long wait for disk drives might find help from another quarter.

Tandy will consider selling the parts needed to upgrade the Dragon 32 to run Tandy's Colour Computer disk drives.

This will come as good news to Dragon owners who have waited for Dragon Data's drives, due out this month. But a third-party peripheral manufacturer will probably have to be involved before you can easily make the Dragon-Tandy drive connection.

The easy solution to get your Dragon running the Colour Computer drives is to swap some Dragon ROM for the equivalent Tandy ROM. The only adjustment you might have to make beyond that is some rejigging of the expansion port on the Dragon, after which you

can plug in the Tandy drives and disk controller.

Although a Tandy spokesman said the company would consider requests to buy the necessary ROMs, he added that installation of the Tandy ROMs in a Dragon would mean the Dragon would no longer be able to run existing Dragon cassette software.

He said this problem could be solved if a third-party peripheral manufacturer developed a board to allow Dragon owners to retain their existing ROMs and add the Tandy ROMs on a switchable expansion board, so you could 'call in' the Tandy ROMs when you need them.

The Tandy spokesman declined to comment on the cost of such a ROM deal, although it looks as if £275 would be the price to beat—that's what Dragon said its 40-track drives would cost.

Boots boost for micros

Boots looks like starting a High Street war with its plans to entice you away from the big micro chain stores.

Boots intends that 250 of its biggest stores will have computers, peripherals and an extensive range of software by the end of September. And 32 of these stores will include a full computer department, with a computer consultant, selling Spectrums, Dragons, Commodores and BBCs.

Boots is attacking a market already experiencing massive growth, and hopes to knock WH Smith off its No 1 spot.

WH Smith holds about 16 per cent of the market, with Dixons and Boots each having about eight per cent.

WH Smith seems to be taking Boots' aims with a pinch of salt, and its only comment was: 'We agree with their view of the market place.' But with 250 'know-how' departments within Smith's stores, three computer shops and another three opening in Cardiff, Exeter and Kensington, Boots has got a lot to compete with to snatch away those sales.

Lasky's too was unperturbed. 'We have got one of the largest ranges of home computers,' said marketing director, Bob Cox.

'Someone coming in making claims that they want to be number one doesn't make that much difference to the way we are operating.'

Polytechnic course

It isn't everybody's idea of a holiday, but if you have time to spare between August 22 and 26 the organiser of a summer computer course at Middlesex Polytechnic would like to hear from you.

Michael McNamara is looking for volunteers to help run the course, which was originally intended for 24 children from nine to 11. But enthusiasm has been so great that 120 children want to take part, and this is stretching the supervisors.

Mr McNamara plans to have groups of 12 children trying programming, game playing, and using a micro as a tool in a broader project.

He wants volunteers experienced in supervising children — ideally primary school teachers. 'Computer experience would be of incredible value,' he says, 'but I'm not really too worried about that — and the course should benefit the volunteers themselves.'

The course will concentrate on the BBC micro. It is being run by local authorities in Barnet and Enfield using the facilities of Middlesex Poly at Cockfosters.

Anyone interested should ring Mr McNamara on 01-368 9583.

Cheaper Ataris?

By Geoff Wheelwright

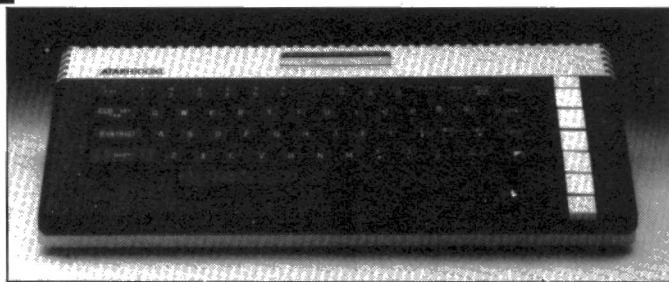
The arrival of Atari's new series of XL home computers in the UK is expected to trigger a substantial price drop for the existing 400 and 800 Atari machines.

The word is that the 16K Atari 400 will be slashed to £99 to compete with Sinclair's Spectrum, while the 800 should drop to around £200 — putting it in line with the £225 price of the Commodore 64.

Although Atari has denied reports of the price drops, Atari dealers say they expect substantial reductions on older machines.

This prediction is well-founded, as the successor to the Atari 400 — the 16K Atari 600XL — is selling in the US for \$150 and the 64K Atari 800XL is tagged at \$300. Even allowing for the normal transatlantic rate of inflation, in which £1 equals \$1, the existing prices for the 400 and 800 would have them selling at the same prices as the new XL machines.

Atari had a press showing of its 600XL last week, and public release of the machine cannot be far off. Atari dealers may have to prepare for stock clearing of the old machines very soon.



Atari 600XL: should trigger more price cuts on the 400 and 800.

The 600XL comes with 16K RAM (expandable to 64K with a memory module) and 24K of ROM that includes an operating system and Atari Basic. It has a full-travel keyboard, is about the same size as a Commodore 64 and has a slot for cartridge software at the top centre of the machine above the keyboard. It uses standard Atari joysticks and will run existing Atari 400 and 800 cartridge and disk drive software.

A new range of peripherals for the 600XL was introduced at the same time as the machine. A small 80-column letter-quality printer will sell in the US as part of a \$465 package that includes a 600XL, the Atariwriter cartridge and a tape recorder.

Atariwriter is a cartridge update of the ageing disk-based Atari Word Processor. It is available from Atari dealers for £65 and will run on the 400 and 800 machines, as well as the new XL machines.

Atari has also announced another long-awaited software release in the form of a £159 — officially licensed — Visicalc package for any Atari machine of 32K or more with a disk drive.

Still in the 'serious' software vein, Atari announced the imminent release of a CP/M module including a Z80 processor, 64K RAM, CP/M 2.2 operating system, a switchable 40 or 80 column video output, a serial I/O port and a monitor output.



SPECTRUM TRACER — The RD Digital Tracer, to be Pro-Tested in next week's PCN, can now be bought over the counter at 150 Spectrum stores. The £55.50 tracer enables Spectrum owners to transfer graphic images from paper to screen. It consists of two pivoting arms and a tracing head attached to an interface. As well as being able to trace, you can use automatic routines from the controlling software to construct circles and straight lines and to erase defined areas. The device represents another boost for Welsh enterprise, being designed and built at RD's South Wales plant.

ZX81 packs persist

The ZX81 starter pack price deal may not be available from every Sinclair dealer. Shops holding old stocks of the machine have found they cannot get rid of them at the new prices.

The good news is that you may still be able to get the starter pack deal well after the two-month offer period expires.

This cheap package is an attempt to boost sales of the ZX81, which had plummeted following the Spectrum price cuts earlier this year.

Under the starter pack deal, you get a ZX81, a 16K RAMpack and a software cassette for an all-in price of £45. This is equivalent to £30 off the price of the products if bought separately. The ZX Printer with five rolls of paper has also been

reduced — £11.95 of paper comes free.

But Sinclair gave little advance warning to dealers about the offer, and is only allowing the offer to be applied to machines ordered less than 14 days before the announcement was made.

It is difficult to estimate how many shops have been caught with stocks of the micro at the old prices.

Terry Brown, deputy managing director of Prism Microproducts, which distributes Sinclair micros, says he has received few complaints from dealers.

'No-one has been ordering ZX81s since WH Smith cut prices a couple of months ago. So there aren't many people out there who have ZX81s,' he said.

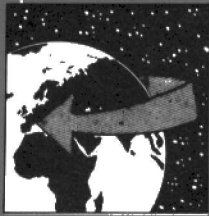
But those who have could turn out to be a hidden blessing for buyers. Because dealers had scant stocks of the ZX81 there has been what Mr Brown describes as a 'rekindling of interest' since Sinclair brought out the offer.

As a result many dealers have placed large orders and are likely still to have stocks at the offer price when the special deal runs out in two months' time. Mr Brown expects many dealers will still be offering the starter pack at £45 to the end of the year.

'It is the kind of thing that is ideal to buy to put into a Christmas stocking,' he said.

This may be wishful thinking but Christmas 1983 promises to be busy for all micro makers.

VIEW FROM JAPAN



Incompatible in more than one sense

By Serge Powell

For a while it looked as if Japan's computer makers were about to come of age. The idea was simple enough. Over the years they have turned to the US's Microsoft to provide the Basic used in their units, but always with a twist to help maintain incompatibility.

In fact, to service this market Microsoft entered into a partnership with Japan's Ascii company, a leading publisher of computer magazines and other vendors' software. That gave the new company Ascii Microsoft a lot of clout. Or so it seemed.

Another normally powerful company is the consumer electrical and electronics giant Matsushita Electrics. Better known as National, Panasonic or Technics it hasn't thrived in the personal computer market. But it could if more software was available for its hardware. Many makers are in the same boat.

It was only a matter of time before someone came up with one standard compatible ROM Basic that, for a fee, all manufacturers could use.

At the beginning of the year Ascii Microsoft, with support from Matsushita, put this idea to a number of manufacturers, including market leaders NEC and Sharp, proposing a compatible Basic known as MSX.

The response was positive, if not enthusiastic, in the case of the software houses which have to write their most popular programs in the dozens of Basics in Japan and their less popular programs for a limited number of makers and a limited number of consumers.

In mid-June the breakthrough — MSX Basic — was unveiled to the public and that's when things began to unravel. Upon contracting to use the MSX Basic, manufacturers were to be hit with a one time fee of \$100,000. When manufacturing began there would be an additional royalty of \$4.50 per unit on a minimum of 33,000 units. If you run these numbers through your computer you would see a minimum cost per manufacturer rounds up \$250,000.

A lot of makers thought that was on the high side and there was no clear indication as to how much the software houses were to be charged for using the MSX Basic.

Into the fray stepped Japan Soft Bank, a leading software vendor. It too would develop a universally compatible ROM Basic and its royalty would be much less than that proposed by Ascii Microsoft. (Though there's debate whether Japan Soft Bank could produce such a Basic at such short notice.)

Within a week, however, the two parties settled. Japan Soft Bank agreed to back the Ascii Microsoft version along with Matsushita and some of the other makers. In return Ascii Microsoft agreed to a lower price.

By then NEC, with some 40 per cent of the PC market and the only assured supply of quality software, was questioning the wisdom of participating in the first place.

After all, the whole fracas was about computers in the \$100 to \$200 range. With software compatibility only price would give one machine advantage over another. And that would lead to a price war which no one could win except, perhaps, Matsushita with its massive consumer electronics distribution channels.

But what about the consumer? Wouldn't the buyers win? As one software authority in Tokyo put it: 'Do we really need compatibility in Basic? Wouldn't it be better to do something around one of the newer high-level languages and make possible a new generation of smaller more powerful home computers?'

Who knows? Certainly not the computer makers in Japan. At this point it looks like the makers who have never done well up to now will go with MSX. Those who have, won't.

And the Apples, Commodores, Sinclairs, Ataris and the rest will continue to gobble up world market share until Japan Inc can get it back together.

Return of The Last One

If you feel that £330 (or even £185) is a bit much to pay for The Last One, the controversial program generator, there's a bit of good news... you can get a cut-down version for £50 plus VAT.

However, the new program is heavily cut down from its precursor, and as a result it can't handle such large jobs.

The principal differences are that only one file, of only 20 fields, may be handled by each program you write, which is limited to a maximum of 25 'flowchart lines'.

Just how limiting this will prove to be is difficult to say, but one question immediately arises... assuming you can do all you want in those 25 lines, how do you write a program that will compare one file with another?

The full-blown version will take 150 lines on CP/M and Apple, and 250 lines on pseudo-16s like the

IBM. And it allows up to 13 files, each of which may have up to 99 fields, so most reasonable applications should be workable with it.

There's another difference, too. The new 'little' TLO doesn't have a modify file option on the main menu, so it will not be simple to alter a data-format after it has been created.

This job isn't difficult on the big TLO, but it's time-consuming, since any program which uses that file must be modified, and this is something of a drawback.

So not being able to do it all on the new version may be something of a blessing in disguise. Provided you get your file-format right first time.

The new Compact TLO is currently available by mail-order from D.J. 'AI' Systems, Station Road, Ilminster, Somerset, tel: (04605) 4117.

Cut-price turtle

Primary schools which send cash when ordering an Edinburgh Turtle can now pick one up for as little as £155.92.

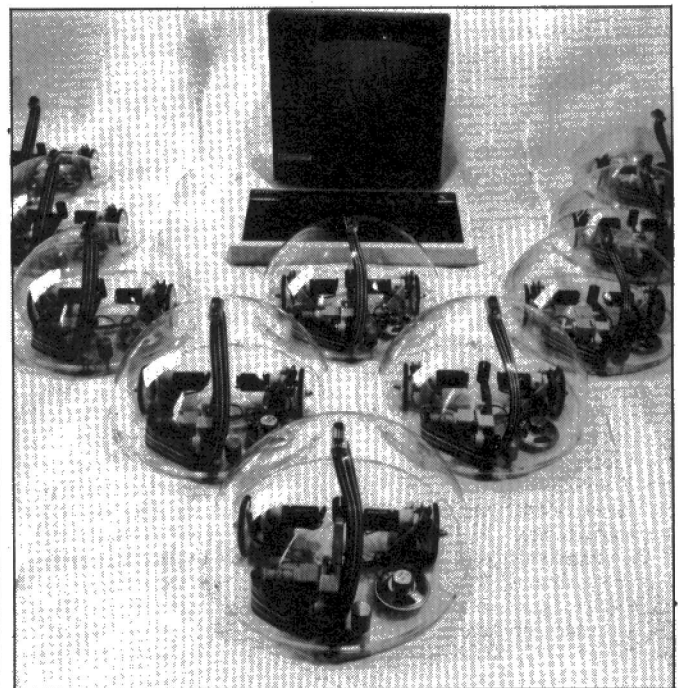
The mechanical robot originally cost £367.67 but Jessop Microelectronics (01-739 3232) redesigned it to almost halve the price. 'It was too expensive for primary schools,' said a spokesman from the company.

The turtle was designed by the Artificial Intelligence Department at Edinburgh University as an aid to

learning for young children. The robot is a two-wheeled machine equipped with a pen which can draw pictures on paper laid on the floor under the control of a computer.

For this cheaper price the turtle now runs off a parallel interface instead of an RS232 serial port. The turtle also has to be configured for different micros.

Schools ordering the device can expect delivery towards the end of September.



A flock of turtles — Jessop Microelectronics has cut the price by more than half.

Jobs dream fades

Young people were warned last week that Youth Training Schemes (YTS) might not be a passport to getting work in the computer field.

Patrick Raymont, of the National Computing Centre in Manchester, said: 'YTSs are not going to produce people suitable for jobs in computing. It only gives basic training and they wouldn't reach the standard to become, for instance, computer operators.'

'I would say that people coming out of Information Technology Exchange Centres have a better chance.'

Mr Raymont is not the only critic. Companies in the computer industry are also cautious about the scheme.

A spokeswoman from software house Lifeboat said: 'I don't think

we would employ someone who came from this scheme, I feel you've got to be a reasonably sized company with enough staff to supervise trainees for them to get any real benefit.'

'We've been approached by a company to take on two trainees from one of these schemes, and the company hinted that we wouldn't have to train them. This, of course, would be totally unfair.' So it seems there are companies prepared to use YTSs to buy cheap labour and give nothing in return, leaving the trainee without instruction. Colin Stokes, sales manager of Imagine said: 'I don't see any reason why we wouldn't use people who came from the scheme. But I think it's useful that companies involved in these schemes have some sort of prog-

ramme ready and train the youngsters properly — or it's just a waste of time.'

The jobs should be there. While other industrial sectors are laying-off workers companies such as Acorn are recruiting 15 people every month. A spokesman from Acorn said: 'Acorn is committed to research and development, therefore the kind of people we would employ would be highly technical. People who come off the YTSs I think would be more suitable on the distribution or selling side.'

'After gaining experience in that area they could then go on to be a support engineer perhaps, with further training.'

So far several companies have undertaken to liaise with the Manpower Service Commission to give

some training to unemployed school leavers (*PCN*, Issue 22). One of these is Silica Shop, 01-309 1111, which will start its scheme on August 15.

Mike West, director of the company, said: 'I think YTS is worthwhile.'

During the year on the scheme trainees will spend six weeks at college and 47 weeks gaining work experience.

'I can't see that a scheme of this sort will be of no good,' added Mr West. 'Computers are going to affect everyone in one way or another. And under the discipline of a real life environment and issues, it gives the trainee a chance to look at a wide spectrum of jobs without committing themselves to one particular career.'

Falling flat

The day when all micros come with a full colour, high resolution flat screen display could be a long way off.

Despite progress in the development of alternatives to the cathode ray tube it is unlikely the cost of flat screen displays will come down to the cost of conventional monitors or televisions until the end of the decade.

This gloomy forecast comes from Stanford Resources which has studied more than 20 techniques for producing flat screen displays.

At the moment, the organisation says, each of these technologies is at least five times the cost of cathode ray tubes on a cost per character basis.

But prices are likely to fall in the next few years and by the end of the decade liquid crystal displays (LCDs) and electrophoretic imaging displays (EPIDs) will be only 50 per cent more costly.

For the foreseeable future, micro makers will rely on TVs and monitors and use flat screen technologies only for special applications, such as portables.

Mind you, it's not only the flatscreen technology that's costly, the report doesn't come cheap either. It costs \$2,275 — but if you're still interested you can get it from International Planning Information. Nordre Ringvej 201, 2600 Glostrup Denmark.

DEC opens the doors on Rainbow

Rainbow users can format their own disks now DEC has retreated from its monopoly of disk supplies.

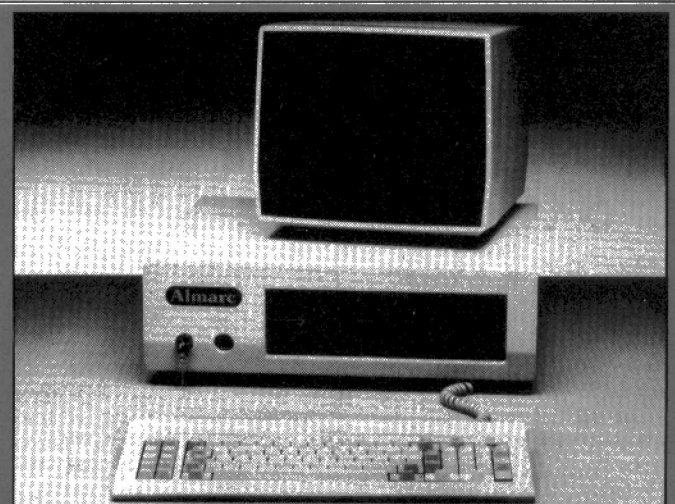
A spokeswoman from DEC said: 'Originally we wanted to maintain a high quality on disks and the best way to do that was manufacture and sell our own. We have made this latest move in response to public demands — they wanted their own formatting facility.'

The company is giving a Rainbow Utility Diskette to users which includes the previously restricted format program. So now Rainbow users can buy blank disks from other sources than DEC.

But unlike IBM, which publishes all the engineering standards of its micro, including hardware and operating system, DEC has played its cards close to its chest. However, with a utility disk it is launching the new Rainbow 100 technical documentation set.

This is a three volume set of manuals that contains all of the technical details on the Rainbow 100, says DEC. The move is seen as a positive sign by the UK software industry.

In addition, the company has made Microsoft MS-DOS 2.0 an operating system option.



SPIRIT — This expensive looking micro, comprising what looks like an IBM keyboard and repainted Sirius cabinet, actually contains the powerful Motorola 68000 16-bit microprocessor. The machine is part of the Almarc Data Systems Spirit range of micros which now offers a choice of Z80, 8086 and 68000 processors. The 68000 version can run the multi-user operating system Unix and you get 10Mb of Winchester disk storage as an extra bonus. Almarc claims the Spirit 1-68 is ready for delivery in exchange for £4,000 plus VAT. The company is on 0602-52657.

New Apple DOS

Apple aficionados finally have a new disk operating system. ProDos is the name, and SOS is its game... the new system is, if not the same, very similar to the Apple III's operating system.

It's more advanced with new features which should ensure continued popularity of the Apple II and IIe.

Among these are the ability to handle disks of any size and to treat them all the same, even 143K 5¼ inch floppies or 40Mb Winchesters!

However, applications written in Applesoft won't have to change, because a program called the Applesoft Command Interpreter, which replaces the old DOS, will interpret 'old' DOS calls, and

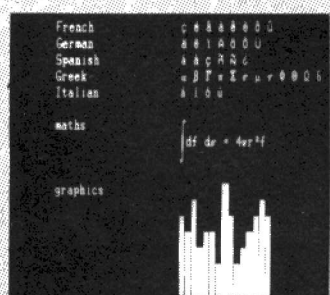
change them so they call ProDos.

They're clever, too, since the new Directory structure is automatically recognised.

This is almost UNIX-like in effect, with hierarchical directories, interrupts, and other glossy features, though these won't be terribly useful until you're using a big disk.

The actual ProDos code sits in the language-card, and though it doesn't use all of it, the spare areas are earmarked for 'future expansion'.

According to Bill Schelderup, who is in charge of ProDos development at Apple Cupertino, the new operating system should be available in early 1984 for about \$50.



MULTILINGUAL PC — The newest version of Microtrend's Trendtext IBM word processing package can cope with every letter in six European alphabets, as well as mathematical notation. It has a double-sized character set, built by using 8-bit character codes rather than the 7-bit ASCII codes. The package is also able to handle business graphics. You can contact Microtrend on (0423) 711878.

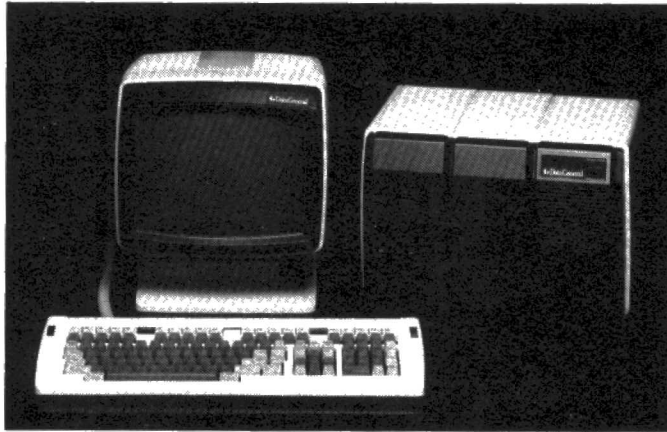
DG on the march

Minibuilder Data General is having a second stab at the personal computer market. The launch of its Desktop Generation machines should make more impact than the company's embarrassing failure with its Enterprise micro.

The 'cat among the pigeons' machine is the Model 10. For just less than the price of an IBM (£2,500), you get a twin processor machine with an 8086 and DG's own MicroEclipse. The Model 10 runs both MSDOS and CP/M86 as well as the minicomputer operating systems AOS, RDOS and MP/AOS.

The Model 10's memory can be expanded from 128K to 768K. Disk storage starts off with IBM PC-compatible floppies and can be upgraded to 15Mb hard disks. A graphics option provides 4,096 colours on a 640 x 240 screen using the GKS standard.

The other two models (numbers 20 and 30) are based on just the



One of DG's Desktop Generation micros, which major on networking.

MicroEclipse processor and are intended for heavier workloads. Data General views stand-alone desk top systems as an underuse of resources and so is pushing the communications and networking aspects of the range. Most systems

are supported including Ethernet and Data General's CEO office system.

Reactions to the system have been very favourable and software houses have already started work on ports to the new machines.

Floppy disk interface for Spectrum

Sinclair's Microdrive hasn't stopped companies such as Technology Research (01-699 5332) developing floppy disk interfaces for the Spectrum.

Selling at £68.25, the card from Technology Research will work with any Shugart standard disk drive. The disk operating system that runs the drives is TRDOS, which the company says has been specially developed for the Spectrum.

The command set is made up of the following functions: SAVE, LOAD, ERASE, DIRECTORY, INITIATE and BASIC, with PASS used to change the disk access password and LOCK used to initiate user-only software access.

The company says the PASS and LOCK commands mean a disk is only accessible to password holders. The LOCK feature reduces the chances of software being copied.

New Tandy to cost under £100

Tandy's new sub-£100, Spectrum-style micro will be unveiled at the Personal Computer World show in September.

The machine comes with a hard-key qwerty keyboard, and full-size space bar — but only 4K RAM standard. It will sell for \$119.95 in the US, but hints from Tandy are that it will come in at under £100 in the UK. It could cost less, since no-one knows yet how much the 16K memory add-on will cost.

The real surprise in this otherwise standard colour micro is the RS232 interface and communications capacity of the machine. The Tandy will use an optional 600 baud modem to communicate with other machines and run standard Centronics printers.

Tandy has departed from its long-standing affair with the 6809 processor and gone for a 6803, but the chips are similar enough to reduce differences in operation.

The machine is light, weighing only 29.5 ounces, and takes up no more space than the Sinclair machine it resembles so much.

Cassette software for the machine will be provided for use through a DIN-style plug at the back — and programming should be easy enough for anyone familiar with either the Dragon or existing Tandy machines as the MC-10 uses yet another version of Microsoft Basic.

The machine should be in Tandy's stores shortly after the PCW show launch.

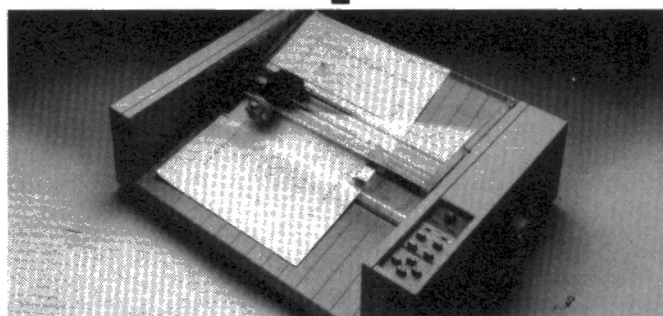
Apple hatches plot

Apple has responded to the increasingly demanding needs of its users by bringing out a four-pen plotter that crashes through the £1,000 barrier.

The Apple 410 Plotter features an unusual inclined plotting bed that can handle paper or transparency materials up to A3 in size. It will be available in September for around £700.

The plotter, which will be compatible with both the Apple IIe and the Apple III, does not depend on the computer's intelligence. It has its own 126 byte ROM. As a result, all you require to draw complex shapes is a single command.

With the machine will come a wide range of accessories including four types of pen in eight colours.



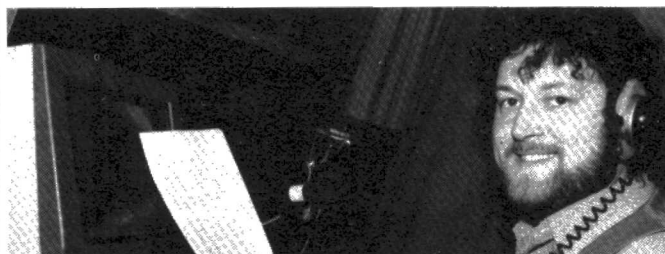
At the core of the Apple 410 is an inclined plotting bed.

The pens can be filled with either water-based or oil-based ink. There are also two widths available: 0.3mm and 0.7mm.

Apple is promising full after-sales support through dealers.

'Although a customer may be prepared to wait a week for his plotter there is no reason for him to wait for pens,' said Stephen Holmes, Apple IIe product manager.

Welsh air byte



Chris Jones, programmed to present 'The Micro Show'.

If you can pick up BBC Wales on your radio you could be in for a treat: your very own computer club of the air.

The station is launching a programme to be called *The Micro Show*

on Friday evenings beginning in October and running for six weeks.

It aims to be a cut above the programmes that have been run before, going beyond the purely educational objective. Presenter

Chris Jones sees the series as a forum for micro users where ideas, information and programs can be exchanged and new developments analysed and explained.

There will be a beginner's section, software and hardware reviews and features and reports covering the whole field of micro-computer use at large.

The most ambitious part of the series will be the broadcasting of software over the airwaves. This is not the first time it has been done but BBC Wales is claiming that this will be the first time that it has been done on a regular basis in the UK. The telesoftware broadcasts will be done at a different time to the main programme. Sunday seems to be the most likely day.

The station is inviting advance comments and suggestion.

Micros under cover

Hot on the heels of CTA's bonding scheme for mail order houses (*PCN Issues 21 and 22*) comes a CTA approved insurance scheme for home computers.

The scheme is underwritten by Domestic & General Insurance Company and is designed to provide owners of low-cost micros with full cover against breakdown and failure of their systems.

All risks insurance (fire, theft and accidental damage) for when the

micro is out of the house can be obtained as an add-on to the policy at extra cost.

The cost of the scheme is broadly in line with the prices suggested in *PCN's* special feature about insurance (*Issue 19*).

For a system, including computer, printer, disk or monitor, costing up to £200 the annual premium is £15. For a system costing between £400 and £500 the premium is £37.50. Above £500 the premium

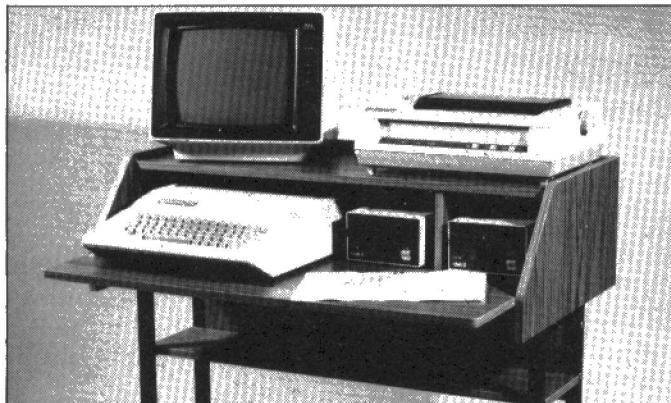
should work out at around 7.5 per cent of the value of the equipment insured.

The all risks option costs around 2.5 per cent of the system's value and will be useful if you want something in addition to your household contents insurance.

'People have complained to us that their household contents policy does not cover them for when they take their micros out of the house to places like computer clubs,' said

Nigel Backhurst, CTA's general secretary. He said there has been an enthusiastic response from CTA members. Apart from dealers, who would be selling the policy to cover users for the costs of repair after the guarantee runs out, at least two manufacturers had expressed interest in enclosing a leaflet on the scheme with each computer.

It is hoped the insurance policy will also be sold by non-CTA dealers and manufacturers.



TAKE THE STAND — Tired of setting up your computer equipment, then putting it away again? Well, the Timpro Personal Computer Desk could help. A choice of widths in a teak-like finish. Contact: Timpro Manufacturing Company, 0253 884105.

Armageddon with a modem

Who will start World War III: will it be Margaret Thatcher, Yuri Andropov, Ron Reagan or a Seattle teenager with a home micro?

If you said the latter, there could be a lucrative career in Hollywood scriptwriting awaiting you. Wargames, a new film on general release from August 18, sees 17-year-old David Lightman inadvertently take on the Defence Department's Wargames computer when he tries to rip-off software from the 'Protevision' software company.

Thinking that he's tapped into Protevision and is playing their latest strategy game on his Imsai S-100 type machine (using a modem

and 8 inch floppies) David sets in motion a process that could lead to nuclear war.

The computer thinks the 'game' is real and begins the process of calling the US to arms.

Back in the real world, Thorn EMI has announced the release of a video game based on the movie. 'Computer Wars' casts you in the part of David (no surprise there) and asks you to convince Joshua that it's all only a game.

The game will be available to run on the Commodore Vic-20, Atari computers and the Texas Instruments 99/4A from September 12. Prices have not yet been revealed.

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Software.

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SULTAN'S MAZE by Christopher Hunt (LYNX & DRAGON)..... £7.95
Enter the 3D Maze in search of the Sultan's jewels, but beware, your strength may run out, or, you may come face to face with the Mad Guardian. A multi-difficulty game with fantastic graphics and sound.

LYNX COMPUTING BOOK by Ian Sinclair..... £6.95
Excellent book, which the beginner will find an invaluable aid, in helping to unravel the LYNX's many varied features!!

GEMPACK IV by W. E. MacGowan (DRAGON & LYNX)..... £7.95
Two great machine code games, with full colour graphics.
In **Sea Harrier** you must land your plane on the aircraft carrier, after dispersing the clouds with chemical bombs, but don't hit the ship!
In **Sub Chase** you must depth charge the wolf pack without being sunk. Both with 4 levels of play from easy to kamikaze!

CHATEAU by Pete Allen (DRAGON)..... £7.95
A new type adventure, in which you must wander the Count's old mansion in search of treasure! Of course, when the Count died and hid his treasure, he also left lots of unpleasant surprises for those brave enough to try and seek out his riches!! Come face to face with Ghouls and Ghosts, Vampires and Trolls; do you run or fight? Will the mysterious Travel Agent suddenly appear and whisk you away to far off places? Where can you find the key or the lamp? Is the clock booby-trapped? Will you die a cold and lonely death, or will you win through to claim the fantastic treasures of The Chateau??

GAMES PACK III by Christopher Hunt (LYNX)..... £7.95
REVERSI Pit your wits against the LYNX with this easy to learn, yet extremely demanding board game. Five skill levels, from novice to grand master. **SNAKE** Guide the snake to the food, but watch out, he will grow and must not eat the wall or himself.
PONTOON An excellent implementation of a favourite card game in full colour with sound. LYNX is a mean Banker.

GOLF by Pete Allen (LYNX & DRAGON)..... £7.95
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Logo log

The man who invented Logo, Professor Seymour Papert, will be on hand at the British Logo User Group's conference and workshop, to answer teachers' problems on his language.

The two-day meeting on September 2-4 will be held at Loughborough University of Technology and will cover the philosophy underlying Logo through to specific practical applications at levels varying from beginners to experts.

Other principal speakers at the conference will include Dr Peter Ross of Edinburgh University, and Deborah Booth, a teacher and member of the Chiltern Logo Project Team.

During the two-day event delegates will get the opportunity to use different machines supporting Logo and there'll be an exhibition.

Contact Pam Valley, 26 Tithby Road, Bingham, Notts NG13 8GN.

Dragon additives

Using your Dragon 32 could become a lot easier with three new products from Elkan Electronics (061-798 7613).

If you find thumbing through your manual a bit tiresome, how about looking at an 18-page quick reference card that holds all the information you may need?

At £3.95 the card shows you Basic software, how to play music, a look at memory mapping and so on. Cards are also available for the Vic 20 at £3.95 and for the 6502 microchip at £2.95.

Dragon Cruncher is a handy conversion program. The menu-driven program converts most Dragon 32 programs for use on the Tandy Colour Computer and vice versa, and costs £7.95 on cassette.

Fast wrist action for playing arcade type games is where the Quickshot joystick could gain you more points. At £14.95 the self-centring joystick has a fire button and contour grip and plugs directly into the Dragon or Tandy Colour Computer with no need for expensive adaptors.

Out of school

School holidays seem to have brought an outburst of educational software.

Currah Computer Components (0632-323535) has produced Chatmaths, a talking program designed to teach four- to six-year-olds addition and subtraction.

The package runs on the unexpanded Vic 20, using allophone synthesis to generate the voice. The commands and the corrective responses are spoken as they appear on the screen. The graphic display enables the child to understand and interpret numbers and sequences heard and seen on the screen.

At £4.99 it can be used as a

teaching aid both in the school and at home.

Collins Educational (041-772 3200) has also slipped onto the educational software scene with several new packages for the Spectrum.

For the games addicts is Game Writer's Pack, at £7.95, which teaches children how to design and invent their own games.

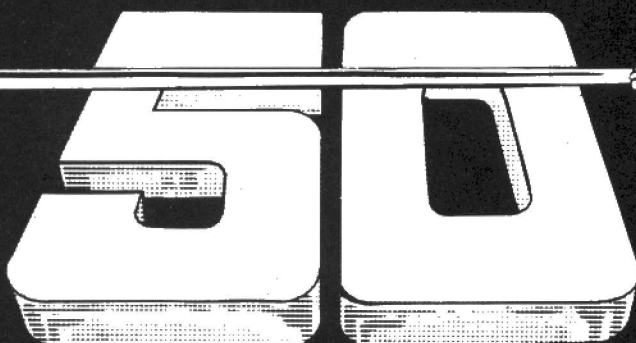
First Numbers at £5.95 is a counting pack consisting of a workbook and a cassette for children starting school.

Also selling at £5.95 you can get What's The Time and Know Your Tables.



FAX 'N' FIGURES — Apple and IBM users can create their own database applications with a new program called File-Fax from Pete & Pam Computers (01-769 1022). Each File-Fax database record occupies one screen page, and you can have up to 31 fields per record. It allows you to make up to four reports for each application, and you can design the reports to suit your specific needs. File-Fax costs £145.95.

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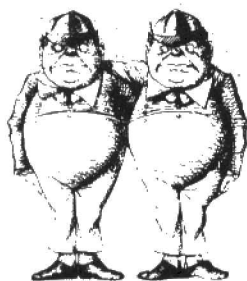
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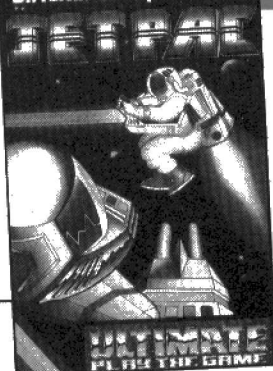
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PCN Charts

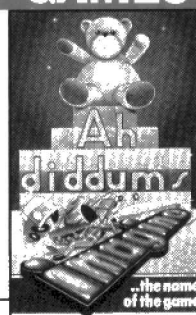
You've followed the micro charts — now here's the games top 30 compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the two weeks up to July 28 and, like the micro charts, do not take account of mail order sales.

The micro charts this week show the number of machines sold in the two-week period ending two weeks before publication date, so they tell the story in the high street

Sinclair ZX Spectrum



GAMES



Top Thirty

		GAME TITLE	PUBLISHER	MACHINE	PRICE
► 1	(1)	Jet-Pac	Ultimate	Spectrum	£5.50
▲ 2	(6)	Ah Diddums	Imagine	Spectrum	£5.50
▼ 3	(2)	Penetrator	Melbourne	Spectrum	£6.95
▲ 4	(8)	Arcadia	Imagine	Spectrum	£5.50
► 5	(5)	Transylvanian Tower	Shepherd	Spectrum	£6.50
▲ 6	(—)	Terror 4D		Spectrum	
▲ 7	(—)	Trans AM		Spectrum	
▲ 8	(10)	SS Enterprise	Silversoft	Spectrum	£6.00
► 9	(9)	Killer Gorilla	Micropower	BBC	£7.99
▲ 10	(21)	Psst	Ultimate	Spectrum	£5.50
► 11	(11)	The Hobbit	Melbourne	Spectrum	£14.95
► 12	(12)	Flight Simulation	Psion	Spectrum	£5.95
▲ 13	(—)	Horace and the Spiders		Spectrum	
▼ 14	(7)	The King	Microdeal	Dragon 32	£8.00
▲ 15	(26)	Krazy Kong	Interceptor	Vic 20	£6.00
▲ 16	(24)	Zenon 1	IJK	Oric	£5.50
▲ 17	(27)	Horace Goes Skiing	Psion	Spectrum	£5.95
▲ 18	(—)	Cookie		Spectrum	
▲ 19	(—)	3D Tanx		Spectrum	
▼ 20	(13)	Zaxxon	Datasoft	Atari	£29.90
▼ 21	(15)	Timegate	Quicksilver	Spectrum	£6.95
▲ 22	(23)	3D Combat Zone	Artic	Spectrum	£4.95
▼ 23	(3)	Gridrunner	Llamasoft	Vic 20	£8.50
▲ 24	(—)	Heathrow ATC		Spectrum	
▲ 25	(—)	Lazerzone		Commodore 64	
▲ 26	(—)	Chess		Spectrum	
▼ 27	(18)	Miner 2049er		Atari	
▲ 28	(—)	Life Cycle		Spectrum	
▲ 29	(—)	Attack of the Mutant Camels	Llamasoft	Commodore 64	
▲ 30	(—)	Monstershell		Spectrum	

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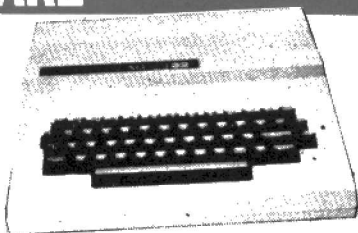
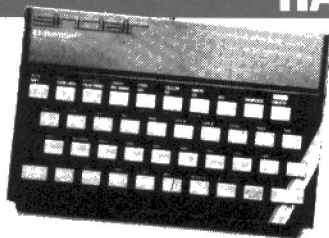
PCN Charts

between June 14 and July 28.

Neither mail order nor deposit-only orders are included and the prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, will be updated every alternate week.

PCN Charts are compiled by MRIB (Computers), London, (01) 408 0250.

HARDWARE



Top Twenty up to £1,000

▲	1	(2)	Spectrum	£99	(SI)
▲	2	(4)	Dragon 32	£175	(DR)
▶	3	(3)	Vic 20	£150	(CO)
▼	4	(1)	BBC B	£399	(AC)
▲	5	(6)	Commodore 64	£299	(CO)
▼	6	(5)	Atari 800	£300	(AT)
▲	7	(11)	Newbrain A	£228	(GR)
▶	8	(8)	Oric 1	£99	(OR)
▼	9	(7)	ZX81	£40	(SI)
▲	10	(13)	Lynx 48	£225	(CA)
▼	11	(9)	Atari 400	£150	(AT)
▼	12	(10)	TI99/4A	£150	(TI)
▼	13	(12)	Colour Genie	£168	(LO)
▲	14	(15)	Tandy Colour	£240	(TA)
▲	15	(16)	Sharp PC1500	£169	(SH)
▲	16	(17)	Apple IIe	£969	(AP)
▼	17	(14)	Epson HX20	£472	(EP)
▲	18	(19)	Sharp MZ80A	£549	(SH)
▲	19	(—)	Aquarius	£99	(MA)
▼	20	(18)	Jupiter Ace	£90	(JU)

Top Ten over £1,000

▶	1	(1)	Sirius 1	£2,754	(ACT)
▶	2	(2)	IBM PC	£2,392	(IBM)
▲	3	(4)	DEC Rainbow	£2,714	(DEC)
▼	4	(3)	Commodore 8096	£1,374	(CO)
▲	5	(7)	Apple III	£2,780	(AP)
▲	6	(8)	Olivetti M20	£2,754	(OL)
▼	7	(6)	HP86A	£1,541	(HP)
▼	8	(5)	Osborne 1	£1,581	(OS)
▲	9	(—)	Televideo TS800	£2,220	(MI)
▲	10	(—)	Tandy TRS80 III	£1,999	(TA)

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My plea on the price of printers

You don't like Mrs T do you? Here we have an administration that at least is showing some resolve in some directions and even some success, especially in the struggle against the stupidity and cupidity of man, as illustrated by the phenomenon of inflation, and then PCN's price is advanced by 10p on 35p.

My calculator reckons this is inflation in excess of 28½%. I realise you are in business to make a living, and there is such a thing as 'What the market will bear', but 28½% is reminiscent of yesteryear, not 1983.

Now for the real object of these few lines—is it possible to mount some sort of campaign to get the prices of printers down to a level more commensurate with other items of hardware? Failing that I would ask if you would run an article which supports the present level so that I can come to terms with the difference between the cost of a computer and price of a printer.

As a rider to the above, is it possible for a more clear indication to be given of the country of origin of items advertised or featured in articles? For many of us it is difficult to be sure from their very anglicised names whether items of equipment are in fact made in Japan, Korea and other such Far Eastern areas. Having seen what has happened to the British motorcycle industry (among others) I am extremely disturbed at the possible appearance of Japanese goods in vast quantities here. Surely we have enough, nay more than enough, cheap material in Britain already that at least identification can help to combat.

British industry has been jolted sufficiently now to realise that it has a tremendous struggle. I suggest PCN supports that struggle in every way it can. Refusal to accept advertisements is one such way.

J Nixon,

Pinner, Middx.

Perhaps Apple and Commodore owners would care to comment, meanwhile we'll bend our minds to the printer problem — Ed.

The Sphinx keeps its mystery

Arghhhh! Once again I have rushed away jerking spasmodically and salivating profusely to lie sobbing on the floor. Once again the mindless boredom of



Don't carry a LOAD on your shoulders,
unburden yourself on PCN's letters page.

wandering between the 'gardener's store' and the 'blacksmith's forge' has overcome me.

Sphinx Adventure — that's what I'm gabbling about. How for Egypt's sake do you get to forbidden fruits such as the 'Dead End Diamond Mine' or the room with walls resembling 'warm ice cream'? Somebody help, please! If I ever find the Sphinx I will smash it into little pieces and jump on them. At the moment the game is about as interesting as watching Tipex dry.

N Sayers
Ware, Herts

The finer points of Commodore 64

Peter Chadwick's letter (PCN Issue 21) is inaccurate and misleading in its comparison of the Sinclair ZX81 and the Commodore 64.

It is as simple to learn from scratch with the 64 as with the ZX81. Anyone who has taught themselves to program on the 64 would experience difficulties similar to his were they to move onto a Sinclair, but not were they to move onto most other machines. This is because Commodore Basic is an implementation of the industry standard Microsoft Basic, not a unique dialect like Sinclair's.

Microsoft Basic does not support computed GOSUB or GOTO. The syntax used by most programmers to respond to a selection entered following a multiple choice menu is
100 INPUT X
110 ON X GOSUB 1000, 2000, 3000

and this is documented on page 122 of the *User's Guide* supplied with the 64.

This *Guide* is intended for people who are using a computer for the first time, so has intentionally been kept simple. It is only the user who has already learnt some programming who will be able enough to move onto more complicated activities such as creating multiple sprites. How to do this is fully explained on pages 133-134 of *The Commodore 64 Programmer's Reference Guide*.

This is sold separately (£9.95) to keep the price of the machine as low as possible for the majority of purchasers who will not need this more advanced *Guide*.

Both the *User's Guide* and the *Programmer's Guide* include an appendix that lists the ASCII codes returned by all the keys, including the eight (not four) 'special function' keys. No knowledge other than the ASCII values returned by these keys is needed to incorporate them into a program. The programmer simply writes code to do whatever special functions are required, and calls the appropriate section of it when a GET statement receives a function key.

The VIC 20 and the Commodore 64 are not completely incompatible. Any Basic program that does not use the USR, SYS, PEEK and POKE statements will run in both machines. The graphics are necessarily incompatible because the VIC 20 has a MOS 6561 video interface controller that is only capable of giving a

22 column × 23 line display, while the 64 has a MOS 6569 VIC chip that gives a 40 × 25 display and supports sprites.

The sound is also incompatible, because the enhanced video capabilities do not leave room in the VIC chip for sound facilities. The 64 uses a separate MOS 6581 sound interface device which gives it far more powerful sound synthesis facilities than are available in the VIC 20.

The VIC 1541 disk drive uses the same disk format as both the CBM 2031 and the CBM 4040 disk drives, so Mr Chadwick's statement that 'Software — or even data disks — from a 64 will not download into a Pet' is completely untrue. Provided it does not use the four statements referred to above, 64 software written in Basic will not only load into a Pet, but will also run in it. All that is needed is a direct command (POKE 41,8: POKE 2048,0) to adjust the Pet's start-of-Basic pointer to match the 64.

Subject to the same constraint on those Basic commands that enable direct interaction with the operating system, plus four minor changes in the Basic (detailed below) any Basic program that runs in an 8032 will run in the 700 series. The four differences are that TI\$ is now seven characters long (including tenths of a second), TI is no longer a reserved variable, ER and ER\$ are now reserved variables, and some screen control codes must be altered to ESCape sequences. Since the 700 uses all the same peripherals (including disk drives) as the 8032, it is nonsense to suggest that data files created with an 8032 cannot be used by a 700.

It is an absurdity to state that software made to run on the 8032 will not use the extra memory of the 8096, since the soft-loaded operating system sold by Commodore for the 8096 (LOS 96 — £99 plus VAT) makes the extra memory available to Basic programs. LOS 96 is sold separately because most users of the 8096 do not require it: they want the extra memory for larger Visicalc models (up to 73K), to run Silicon Office, or for word processing with more text held in RAM (Wordpro V Plus).

It is not Commodore that fails to provide upward compatibility, but Sinclair — as anyone who has tried to read their ZX81 tapes into their

Spectrum knows only too well. One should also remember that Commodore has had disk drives available for the 64 ever since the 64 itself was launched: Sinclair's Microdrive has taken 15 months to arrive, and turns out only to be a tape drive!

John Collins,
Technical Executive,
Commodore Business
Machines (UK).

Oh dear! Poor Peter Chadwick. He can't cope with the CBM 64 because he is only used to a 1K black and white oversized matchbox!

I would not deny that the manual and version of Basic is not foolproof, but would say that a little thought and logic on the part of the user would go a long way.

If Peter wants to program I suggest he buys the programmer's manual, if he wants to play space invaders, which would not stretch his brain, he can sit back and enjoy the colour, sound and graphics of the CBM 64 — something the ZX81 can never match.

Gary J Starling
Stanford le Hope, Essex.

Commodore and the waiting game

What have you got against the Commodore 64? As one of the founder subscribers to your magazine I am appalled with the lack of attention given to what I class as a superb machine.

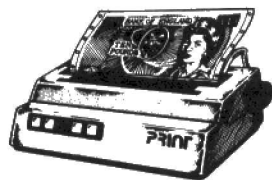
I hope you don't take this as a standard my-computer's-better-than-yours letter because it isn't. I have absolutely nothing against any other machine on the market but I would like to see the odd review of a CBM 64 game in Gameplay. To date I think you have reviewed only one.

I know it could be said that the 64 is a new machine so there isn't much software for it. This may have been true a few months ago but now, well, there are dozens of games and programs on the market from various sources. There is even stuff coming over from the US, so please, please, please! A little more attention.

Apart from that I think your magazine is great.

Kevin Tye
Shirley, Southampton.
Phew! Made it just in time.
Check out Micropaedia next week. Pull it out, keep it safe... it's all about the 64! — Ed.

PCN £10 Star Letter

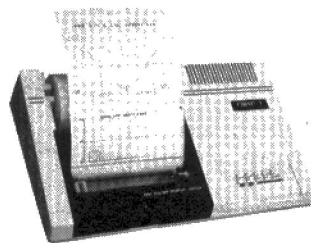


A custard pie for Oric

Not being a whizz-kid and all that sort of thing, it is with some trepidation I write this note. Additionally, the point I make could well have been already put to you by many others; the advertisement in question has possibly appeared before I noticed it on page 60, PCN No. 20, and perhaps I ought to address my remarks to Oric.

Anyway, here goes.

The advert is for Oric's MCP40 Colour Printer, which is illustrated together with Sin and Cos curves. The x axis is marked 0 to 2π , with division at $\frac{1}{4}\pi$, π , and $\frac{3}{4}\pi$. To save this household going completely bananas, please confirm that the $\frac{1}{4}\pi$ and $\frac{3}{4}\pi$ should read $\frac{1}{2}\pi$ and $\frac{3}{2}\pi$.



If I am right, three cheers to the Open University (which introduced me to Sin etc. . . if you know what I mean) and a slap on the wrist for Oric.

J Nixon
Pinner, Middlesex.
Well, we think you're right. Don't go bananas, just accept our star letter prize while we wait for Oric to clear up the confusion. (Mind you, judging by past performances, waiting for Oric is not to be recommended . . .)
— Ed.

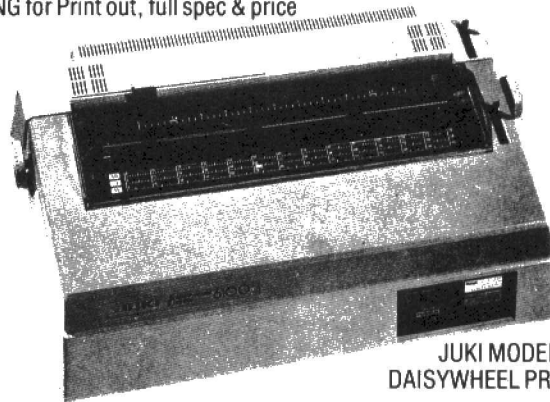
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Data access on the Oric

Q I have an Oric 1 and am working on a program which requires data to be selected from a large alphabetical DATA section at the end of the program. Unfortunately, time is lost when READING through to names a long way down the list and, as you know, arrays are lost when programs are CSAVED.

Is there any way to use the DATA pointer to perform a binary search to find an item in the DATA block quickly?

Alan Hunne,
Broughty Ferry, Angus

A I'm not sure what you are looking for. There is no built-in way to manipulate the DATA pointer. Many Basics have a 'RESTORE line number' that lets you move the pointer to a specified DATA line. The Oric doesn't but it would be quite simple for an experienced 6502 programmer to patch in a small routine using the Oric's useful ! and & commands.

Are you sure you need it? If the data is the same each time it is used, can't you just READ it all into arrays after the program has loaded and access it as freely as you wish?

The problem with this is that you will duplicate some of the information you've stored as DATA in your variable space. But if you've got the memory, it makes sense to put it to use.

As it stands, you can't SAVE arrays on the Oric but there are two ways to do it if you need to. Slow, nasty and unpleasant is simply to figure out where in memory your data statements are and then POKE into them. CSAVE the program to store the new DATA.

The preferred method is to use the cassette file-handling patches freely available from dear old Oric. Have a look in Tangerine's beautiful *Oric Owner* issue 2, where they are described in detail. What a shame they weren't included with the machine!

Names	Points	Games	Points/Games
Ben	12	24	0.5
George	20	12	1.66
Henry	30	13	2.31
Paul	40	10	4

A shot at keeping the score

Q I bought a 16K Spectrum two months ago and am learning to program. I want to write a statistics program for a basketball team. Can you give me a hint how to input and store data as above?

Marcel Op den Camp,
Scharnerweg, The Netherlands

A Whenever you have related information like this, you'll find it easiest to use arrays to store and process the data. Chapter 12 of the Spectrum manual is a pretty good introduction.

Arrays are like lists or tables of ordinary variables. To set them up, you use the DIM statement. DIM C(10) creates a list of 10 variables with the names C(1), C(2), C(3) and so on up to C(10). The crucial point is that the number in brackets (the subscript) doesn't have to be a number—it can be any numerical expression.

So to read ten values into the Spectrum you could use DIM C(10) followed by FOR i = 1 TO 10: INPUT i: NEXT i. You can print them out, just use FOR i = 1 TO 10: PRINT i: NEXT i and so on.

Your example is slightly more complicated in that it is a table. DIM will do this as well—DIM T(4,10) would create a

table (or matrix) of four columns by ten rows, for example.

The other complication is that you want to store the players' names. These must be in a string array separate from a numerical array.

The short program is just to give you an idea of how to go about your own program. It lets you type in the players' names, points and games and calculates the points/games figure for each player. Then it prints out the whole table.

It uses two arrays. A\$(p,10) is used to keep the names of the players. A(p,3) holds the other information. The first subscript is the player number and the second a column number where column 1 is for points, 2 is for games and column 3 is for points/games. Notice that if more than four people turn up for a game (!), all you have to do is alter p at the start of the program. The value of 4 isn't repeated as a constant every time the array is used.

Back-street Atari upgrade

Q I own an Atari 400 and wondered if, like the 800, it has space behind the cartridge slot for memory modules. If so, where can they be purchased and how much do they cost?

Gary Watkins,
Sheerness, Kent

A This is a slightly delicate situation. There aren't any modules and slots as on the 800 but memory upgrades are possible. Atari sensibly turns a blind eye to dealers who are prepared unofficially to fit memory directly to the 400.

Read a few ads and phone a few numbers. You shouldn't find it difficult to arrange a 'back street' memory upgrade. One obvious clue that you'll see advertised is the dealer who offers both 16K and 48K Atari 400s. That extra memory had to come from somewhere.

As for price, around £60 seems to be the rate for a 16K to 48K operation.

Is the Vic right for learning?

Q I am 13 years old and own a Vic 20. Many of my school friends have ZX Spectrums and Texas 99s and claim that these machines are better than a Vic—even when it has been expanded.

I am trying to learn how to program and am concerned that the Vic is not the right machine for my needs. What do you advise?

David Schilder,
Clacton-on-sea, Essex

A It's easy to become madly fond of your own machine. You'll even find that machines shape people. Those who learned on an Apple are a different bunch from those who learned on Tandy Model 1s, and so on. The best people tend to be those who overcome such prejudices and learn several machines.

The other point is that every micro has faults. You know the Vic 20 and will be aware of them, but it's as good as any other machine for learning on. Its standard 8K Microsoft Basic is much like that used on hundreds of other micros, so you'll easily learn those.

The Vic's crude language is actually 'good' for people. Commodore hasn't included any sound and graphics commands so you have to fiddle about with PEEK, POKE and so on to do it yourself. This means you'll learn a lot about the way computers work because you'll have to learn about bits, bytes, memory maps and so on before you would with other machines.

```

10 REM Array demo
20 DIM a$(4,10): REM names
30 LET p=4
40 DIM a(p,3): REM points etc
50 REM enter data
60 FOR n=1 TO p
70 CLS: PRINT "Enter data for
  Player ";n
80 INPUT "Name ";a$(n)
90 INPUT "Points ";a(n,1)
100 INPUT "Games ";a(n,2)
110 NEXT n
120 REM calculate p/g
130 FOR n=1 TO p
140 LET a(n,3)=a(n,1)/a(n,2)
150 NEXT n
160 REM Print results
165 CLS: PRINT "RESULTS:": PRI
  NT
170 FOR n=1 TO p
180 PRINT a$(n);TAB 10;
190 FOR c=1 TO 3
200 PRINT a(p,c);" "
210 NEXT c
220 PRINT
230 NEXT n
240 STOP
  
```

Program for creating a games league—see 'A shot at keeping the score'.



If you've got something to crow about . . . a bit of magic that'll make the world a better place for micro users, then send it to **PCN Microwaves**—our regular readers' hints and tips page. We'll pay you £5 if we print it. We'll pay you even more if your little gem gets our vote as microwave of the month. Think on . . . and write to **Microwaves, PCN, 62 Oxford Street, London W1A 2HG.**

Define the Commodore 64 sprite

The Commodore 64 manual shows how to define one type of sprite at a time using sprite memory area 13 (locations 832 to 894). Three other sprite areas are easily available:

Area 11 locations 704-766

Area 14 locations 896-958

Area 15 locations 960-1022

These can be used in the same way as area 13 by POKEing 2040-2047 with the numbers 11, 14 or 15 and poking data into the corresponding locations. This will let you have four sprites on screen at once.

Two other useful locations are 56321 and 56320. These are joystick ports one and two and can be PEEKed to find their value.

*Simon Gardener,
Newport, Gwent*

Avoid the BBC bug

Using 'imploded' characters on the BBC can cause a difficult bug. When you boot the machine or execute *FX 20,0, the character definitions are 'imploded', that is there is room for 32 user defined character definitions stored a &C00 onwards. Any user defined character (that's with a code greater than 128) will appear four times in the character set. For example, if you define ASCII &E0 (224), the same character will appear at codes &80, &A0, &60 as well as &E0.

All this is in the manual but it omits to say that if you print a character on the screen and then re-examine it, it is the lowest of the four codes that gets returned. So, if you print a 224 on the screen and then

re-examine it, the BBC returns 128!

This presumably happens because the BBC searches through the character definitions from the first character onwards and returns the code of the first match it finds. Neither the hard or soft resets alter the character definitions, so this can cause other problems.

If you run a program that uses 224 as a block character and then run a program that uses 230 for a similar block, without altering 224, any attempt to read back the code for the character will result in ASCII 224 and not 230.

Once you are aware of what happens, bugs caused by this are easy to spot. But as a general rule, if you are using 'imploded' characters, clear the buffer from &C00 to &CFF before use and remember to check for the lowest of the four possible codes.

*David Abbot,
Horsham, Sussex*

Take a break on the Epson HX20

Epson HX-20 programmers may find it useful to disable the break key during a program. This crude technique disables the whole keyboard by altering the keyboard interrupt vector to point to a 'Return from Interrupt' instruction.

These subroutines should suffice. Remember to enable the keys before an INPUT or ending the program. Or else, it's back to the reset key.

*Elizabeth Wald,
Southampton*

```
10 POKE$H116,&H90:POKE$H
117,&HEB:RETURN:'DISABLE
KEYBOARD
20 POKE$H116,&HEF:POKE$H
117,&H49:RETURN:'ENABLE
KEYBOARD
```

Dragon recollections

A useful editing feature is available on the Dragon that isn't listed in the manual. If you make a mistake while editing a line, just press Shift and ↑ together, then press the A and ENTER keys. This recalls the line as it was before you edited it.

*FR Ellahi,
Halifax, West Yorks*

Oric sounds fantastic

S Hammet, *PCN Microwaves issue 21*, gave some useful addresses for sound on the Oric 1. This program provides access to the useful subroutine at #FA6C.

After loading the machine code, the program asks for numbers in the range 0-255. These are loaded into the Y and X registers respectively and provides a total of over 65,000 possible sounds.

I have not found a coding for which numbers produce particular sounds so you will have to experiment yourself. Some of the sounds I've heard are helicopters, sirens, guns, explo-

sions, pure tones, all colours of noise and lots of others although some values produce no sound or just can't be heard.

Some of the better sounds I have found are:

Y register	X register
#FC	#0F
#FC	#2A
#FC	#2A
#FC	#82
#FC	#A9
#FC	#B9
#FC	#EC
#FC	#F7
#FD	#0B

I presume that ZAP, PING and SHOOT must have codes for this routine but have yet to find them. Happy hunting!

*Martin Wolff,
Bromley, Kent*

```
10 FOR I=#A000 TO #A007
20 READ A$: A$="#"+A$:A=VAL(A$)
30 POKE I,A
40 NEXT I
50 DATA A0,00,A2,00,20,6C,FA,60
60 INPUT "Values for Y and X":Y,X
70 POKE #A001,Y:POKE #A003,X
80 CALL #A000
90 GOTO 60
```

Dragon's key to continue

A 'PRESS ANY KEY TO CONTINUE' pause on the Dragon is usually handled using the INKEY\$ function. Unfortunately, this will halt the program if BREAK is pressed. A better method is to call the ROM routine at 41194. So you could use a line like: 1000 PRINT "PRESS ANY KEY TO CONTINUE": EXEC 41194.

This call will flash the cursor until a key is pressed.

*John Buckley,
Salford, Manchester*

Tandy logo banished

The Tandy logo can be a bit tiring everytime you boot up a Model II. To remove it, just type: PATCH SYSRES/SYS A=24D3, F=00, C=3B. Similarly, if you don't want to re-enter the time, use: PATCH SYSRES/SYS A=2390, F=0A, C=39. You can lose the time and date with: PATCH SYSRES/SYS A=2367, F=73,

C=CA. With these patches and a simple build file, you could even have quite a presentable disk.

*DJ Owen,
Henley-on-Thames*

Newbrain shortcut

Location 43 on an unexpanded Newbrain contains KBMODE. POKEing 1 into this location will be just like Control & 1 from the keyboard. When a keyboard device is open (5 or 6), a much neater way is simply to PUT (device number), 1 to force CAPS LOCK.

*Dave Gunthorpe,
Birmingham B16*

Commodore DOS

Commodore 64 owners with the 1541 disk drive will rapidly tire of having to use the demo disk every time they want to use the DOS wedge. The following sequence of commands allows the machine code to be saved:

```
POKE 44,204:POKE 43,0
POKE 46,207:POKE 45,89
SAVE "DOS 5.1",8,1
```

Tim Arnott, Southsea, Hants

This listing by Brian Cadge enables you to autorun a program and create a title page for it.

Dragon takes a title

Last week we got you all excited at the idea of having Spectrum-style title screens while loading programs on your Dragon. This week we deliver our promise and let you do just that.

We'll launch into the program in a moment, but first a few brief words of explanation. Lines 30 to 480 of the assembly language listing are concerned with the screen editor and are relatively easy to follow, but lines 490 onwards may need some explanation.

Firstly, the name is stored in line 500. The filename used is AUTORUN, but this can easily be changed if using an assembler — see line 740. Then the section of machine code which will load and autorun a program is copied from lines 590 to 730 by line 520 into RAM starting at loc. 770.

This is normally used as a keyboard buffer. When this is loaded back into the machine it needs to be executed and the first thing the Dragon does after loading is to print OK.

When a character is printed, a call is made to loc. 359 which usually contains an RTS code, so by setting 359 to a jump to 770 instruction the program boots itself up. This is done in line 530. Subroutine @CSAVE starting at line 560 sets up the parameters and then makes a ROM call to the CSAVEM routine. This saves the memory from 256 to 1535 — the end of the text screen memory.

So, when the code is reloaded, your picture appears on the screen and the

```

5 BASIC LOADER PROGRAM
10 CLEAR200,31999
20 FOR I=1 TO 506:READA$:Z=VAL("&H"+A$):CS=CS+Z:POKE 31999+I,Z:NEXT
30 IF CS<>50657 THEN STOP
40 DATA BD,BA,77,8E,4,0,BF,1,37,86,80,B7,1,36,7F,1,3A,86,FF,23,1F,89,84,FB,B7,FF
  23,86,FF,B7,FF,22,7F,FF,23,8E,1,37,86,84
50 DATA B7,1,39,17,0,DC,F6,1,39,E7,84,81,8,26,C,8C,4,0,27,E7,30,1F,BF,1,37,20,E0
  81,9,26,C,8C,5,FF,24,D7,30,1,BF,1
60 DATA 37,20,D0,81,A,26,D,8C,5,DF,22,C7,30,88,20,8F,1,37,20,BF,81,5E,26,D,8C,4,
  20,25,86,30,88,E0,BF,1,37,20,AE,81,5F,26
70 DATA 5,73,1,3A,20,A5,81,3,10,27,0,A1,81,D,26,2C,8D,17,8D,8B,E5,81,30,23,F9,81
  3A,24,F5,80,31,C6,10,2D,CB,80,FF,1,36,20
80 DATA 82,C6,32,86,FF,22,88,2,B7,FF,22,86,64,4A,26,FD,5A,26,F0,39,81,C,26,B,F6,
  1,36,CB,F,8D,BA,79,16,FF,60,81,13,26,1,39
90 DATA 7D,1,3A,26,19,81,60,24,4,8A,40,20,2,80,60,A7,64,8C,5,FF,24,5,30,1,BF,1,3
  7,16,FF,3D,81,30,10,25,FF,37,81,3A,24,7
100 DATA 80,30,8B,1,36,20,E0,81,41,10,25,FF,26,81,47,10,24,FF,20,80,37,8B,1,36,2
  0,CD,A6,84,88,40,A7,84,8D,2,20,F6,10,8E,7,00
110 DATA BD,8B,E5,26,5,31,3F,26,F7,39,32,62,39,8E,1,D2,10,8E,7E,F2,A6,A0,A7,80,8
  C,1,DA,25,F7,8E,7E,73,10,8E,3,2,A6,80,A7,A0
120 DATA 8C,7E,F1,23,F7,86,7E,B7,1,67,8E,3,2,BF,1,68,8D,8,86,39,B7,1,67,16,FE,C9
  78E,1,0,BF,1,E7,34,10,8E,5,FF,34,10,8E
130 DATA 3,2,BF,1,E5,34,10,7E,99,18,39,12,7C,0,68,86,39,B7,1,67,86,4,0,89,40,B7,
  4,0,AD,9F,A0,4,8E,1,DA,9F,7E,AD,9F,A0
140 DATA 6,26,59,B6,1,E2,26,2D,9E,19,9F,7E,34,10,AD,9F,A0,6,26,48,35,10,86,0,7C,
  4C,27,6,30,89,0,FF,20,E8,8E,0,7E,30,1F,9F
150 DATA 1B,8D,BD,DC,8D,84,1F,BD,83,ED,7E,84,9F,8E,1,E7,9F,7E,34,10,AD,9F,A0,6,2
  6,1A,35,10,86,0,7C,4C,27,6,30,89,0,FF,20,E8
160 DATA BE,1,E5,9F,9D,BD,BD,DC,6E,9F,0,9D,C6,2A,7E,83,44,12,41,55,54,4F,52,55,4
  E,20

```

```

7D4A 24D7 170 BHS @LOOP
7D4C 3001 170 LEAX 1,X
7D4E BF0137 170 STX @CURPOS
7D51 20D0 170 BRA @LOOP
7D53 810A 180 @NORIG CMPA #10
7D55 26D0 180 BNE @NODOW
7D57 8C05DF 190 CMPX #1535-32
7D5A 22C7 190 BHI @LOOP
7D5C 308820 190 LEAX 32,X
7D5F BF0137 190 STX @CURPOS
7D62 20BF 190 BRA @LOOP
7D64 815E 200 @NODOW CMPA #94
7D66 26D0 200 BNE @NOUP
7D68 8C0420 210 CMPX #1024+32
7D6B 2586 210 BLO @LOOP
7D6D 3088E0 210 LEAX -32,X
7D70 BF0137 210 STX @CURPOS
7D73 20AE 210 BRA @LOOP
7D75 815F 220 @NOUP CMPA #95
7D77 26D0 220 BNE @NOTOG
7D79 73013A 230 COM @TOGGLE
7D7C 20A5 230 BRA @LOOP
7D7E 8103 240 @NOTOG CMPA #3
7D80 102700A1 240 LBEO @SAVE
7D84 810D 250 CMPA #13
7D86 262C 250 BNE @NOCOL
7D88 8D17 260 BSR @BEEP
7D8A BDBBE5 270 @COLS JSR 48101
7D8D 8130 280 CMPA #48
7D8F 23F9 280 BLS @COLS
7D91 813A 280 CMPA #58
7D93 24F5 280 BHS @COLS
7D95 8031 280 SUBA #49
7D97 C610 280 LDB #16
7D99 3D 280 MUL
7D9A CB80 280 ADDB #128
7D9C F70136 280 STB @COL
7D9F 2082 280 BRA @LOOP
7DA1 C632 290 @BEEP LDB #50
7DA3 B6FF22 300 @BED LDA 65314
7DA6 8802 300 EORA #2
7DA8 B7FF22 300 STA 65314
7DAB 8664 300 LDB #100
7DAD 4A 310 @DEL DECA
7DAE 26FD 310 BNE @DEL
7DB0 5A 310 DECB
7DB1 26F0 310 BNE @BED
7DB3 39 310 RTS
7DB4 810C 320 @NOCOL CMPA #12
7DB6 26D0 320 BNE @NOCLS
7DB8 F60136 330 LDB @COL
7DBB CB0F 330 ADDB #15
7DBD BDBA79 330 JSR 47737
7DC0 16FF60 330 LBRA @LOOP
7DC3 8113 340 @NOCLS CMPA #19
7DC5 26D1 340 BNE @NORET
7DC7 39 340 RTS
7DC8 7D013A 350 @NORET TST @TOGGLE
7DCB 2619 350 BNE @GRAPHIC

```

```

7D00 20 PRT
7D00 30 @START EQU *
7D00 BDBA77 40 JSR 47735
0136 50 @COL EQU 310
0137 60 @CURPOS EQU 311
0139 70 @STORE EQU 313
013A 80 @TOGGLE EQU 314
7D03 8E0400 90 LDX #1024
7D06 BF0137 90 STX @CURPOS
7D09 8680 90 LDA #128
7D0B B70136 90 STA @COL
7D0E 7F013A 90 CLR @TOGGLE
7D11 B6FF23 100 LDA 65315
7D14 1F89 100 TFR A,B
7D16 84FB 100 ANDA #251
7D18 B7FF23 100 STA 65315
7D1B 86FF 100 LDA #255
7D1D B7FF22 100 STA 65314
7D20 F7FF23 100 STB 65315
7D23 BE0137 110 @LOOP LDX @CURPOS
7D26 A684 110 LDA ,X
7D28 B70139 110 STA @STORE
7D2B 1700DC 120 LBSR @INKEY
7D2E F60139 130 LDB @STORE
7D31 E784 130 STB ,X
7D33 8108 140 CMPA #8
7D35 26D0 140 BNE @NOTLEFT
7D37 8C0400 150 CMPX #1024
7D3A 27E7 150 BEQ @LOOP
7D3C 301F 150 LEAX -1,X
7D3E BF0137 150 STX @CURPOS
7D41 20E0 150 BRA @LOOP
7D43 8109 160 @NOTLEFT CMPA #9
7D45 26D0 160 BNE @NORIG
7D47 8C05FF 170 CMPX #1535

```


DRAGON MACHINE CODE PART 2

copied routine at loc. 770 starts executing. Notice that this had only relative jumps to make it relocatable.

The first thing to be done by this routine is to increment the line number loc. 104 to stop the flashing square in the top left corner. Loc. 359 is restored to an RTS instruction — otherwise the routine would keep running itself for ever! As an odd number of pages — five — have been loaded into RAM (a page is 256 bytes), the flashing square has inverted the first character on the screen, and it's restored by line 600.

In line 610 the routine starts searching for the next program on the tape — the one to be autorun. When one is found, it loads the header into the cassette buffer at loc. 474 — the header contains the filename and

type of program etc. Line 640 checks for a machine code program and branches if found, otherwise the Basic is loaded until loc. 124 contains an end-of-file flag.

The program then makes 4 ROM calls. First it turns off the motor, the next two set up Basic parameters for the new program — these routines are called by the normal CLOAD command — and finally it executes a RUN routine and thus the Basic program autoruns.

The machine code loader routine loads the code until an EOF flag is found, then it stores the entry address in the EXEC vector and jumps to that address.

If any errors are found, @ERROR is executed in line 720 — this produces an I/O ERROR message.

Finally, how to use the program:

ENTER n	Sets colour to n
CLEAR	Clears screen to current colour
BREAK	Saves design and autorun header
SHIFT UPARROW	Toggle graphic/text mode
SHIFT @	Return to Basic
SHIFT 0	Toggle reverse video on/off

Note: Basic programs to be autorun must be saved as normal.

Machine code programs must not be loaded above loc. 32500 unless a CLEAR command has been typed or the machine stack may be overwritten causing a crash.

The correct syntax for the CSAVEM command is: CSAVEM "PROGRAM", Start, End, Entry address.

7DCD 8160	360	CMFA #96	7E60 3410	560	PSHS X
7DCF 2404	360	BHS @INV	7E62 8E05FF	570	LDX #1535
7DD1 8A40	360	DRA #64	7E63 3410	570	PSHS X
7DD3 2002	360	BRA @PRT	7E67 8E0302	570	LDX #770
7DD5 8060	370	@INV SUBA #96	7E6A BF01E5	570	STX 485
7DD7 A784	380	@PRT STA ,X	7E6D 3410	570	PSHS X
7DD9 8C05FF	380	CMFX #1535	7E6F 7E991B	570	JMP 39195
7DDC 2405	380	BHS @NOINC	7E72 39	580	RTS
7DDE 3001	390	LEAX 1,X	7E73 12	590	@COPY NOP
7DE0 BF0137	390	STX @CURPOS	7E74 7C0068	600	INC 104
7DE3 16FF3D	390	@NOINC LBRA @LOOP	7E77 8639	600	LDA #57
7DE6 8130	400	@GRAPHIC CMFA #48	7E79 B70167	600	STA 359
7DE8 1025FF37	400	LBLO @LOOP	7E7C B60400	600	LDA 1024
7DEC 813A	410	CMFA #58	7E7F 8840	600	EDRA #64
7DEE 2407	410	BHS @ALPHA	7E81 B70400	600	STA 1024
7DF0 8030	420	SUBA #48	7E84 AD9FA004	610	JSR (#A004)
7DF2 8B0136	420	ADDA @COL	7E88 8E01DA	620	LDX #474
7DF5 20E0	420	BRA @PRT	7E8B 9F7E	620	STX >126
7DF7 8141	430	@ALPHA CMFA #65	7E8D AD9FA006	630	JSR (#A006)
7DF9 1025FF26	430	LBLO @LOOP	7E91 2659	630	BNE @ERROR
7DFD 8147	440	CMFA #71	7E93 B601E2	640	LDA 474+8
7DFF 1024FF20	440	LBHS @LOOP	7E96 262D	640	BNE @MCODE
7E03 8037	440	SUBA #55	7E98 9E19	650	LDX >25
7E05 8B0136	440	ADDA @COL	7E9A 9F7E	660	@CLOAD STX >126
7E08 20CD	440	BRA @PRT	7E9C 3410	660	PSHS X
7E0A A684	450	@INKEY LDA ,X	7E9E AD9FA006	660	JSR (#A006)
7E0C 8840	450	EDRA #64	7EA2 2648	660	BNE @ERROR
7E0E A784	450	STA ,X	7EA4 3510	660	PULS X
7E10 8D02	450	BSR @KEY	7EA6 B6007C	660	LDA 124
7E12 20F6	450	BRA @INKEY	7EA9 4C	660	INCA
7E14 108E07D0	460	@KEY LDY #2000	7EAA 2706	660	BEQ @EOF
7E18 BDBBE5	470	@KEY2 JSR 48101	7EAC 308900FF	660	LEAX 255,X
7E1B 2605	470	BNE @PRESS	7EB0 20E8	660	BRA @CLOAD
7E1D 313F	470	LEAX -1,Y	7EB2 8E007E	670	@EOF LDX 126
7E1F 26F7	470	BNE @KEY2	7EB5 301F	670	LEAX -1,X
7E21 39	470	RTS	7EB7 9F1B	670	STX >27
7E22 3262	480	@PRESS LEAS 2,S	7EB9 BD8DDC	670	JSR 48604
7E24 39	480	RTS	7EBB BD841F	670	JSR 33923
7E25 8E01D2	490	@SAVE LDX #474-8	7EBF BD83ED	670	JSR 33773
7E28 108E7EF2	490	LDY #@TEXT	7EC2 7E849F	680	JMP 33951
7E2C A6A0	500	@NAME LDA ,Y+	7EC5 BE01E7	690	@MCODE LDX 487
7E2E A780	500	STA ,X+	7EC8 9F7E	700	@CLM STX >126
7E30 8C01DA	500	CMFX #474	7ECA 3410	700	PSHS X
7E33 25F7	500	BLO @NAME	7ECC AD9FA006	700	JSR (#A006)
7E35 8E7E73	510	LDX #@COPY	7ED0 261A	700	BNE @ERROR
7E38 108E0302	510	LDY #770	7ED2 3510	700	PULS X
7E3C A680	520	@COPY LDA ,X+	7ED4 B6007C	700	LDA 124
7E3E A7A0	520	STA ,Y+	7ED7 4C	700	INCA
7E40 8C7EF1	520	CMFX #@ENDCOPY	7ED8 2706	700	BEQ @EOF2
7E43 23F7	520	BLS @COPY	7EDA 308900FF	700	LEAX 255,X
7E45 867E	530	LDA #126	7EDE 20E8	700	BRA @CLM
7E47 B70167	530	STA 359	7EE0 BE01E5	710	@EOF2 LDX 485
7E4A 8E0302	530	LDX #770	7EE3 9F9D	710	STX >157
7E4D BF0168	530	STX 360	7EE5 BD8DDC	710	JSR 48604
7E50 8D08	540	BSR @CSAVE	7EE8 6E9F003D	710	JMP (<157>)
7E52 8639	550	LDA #57	7EEC C62A	720	@ERROR LDB #42
7E54 B70167	550	STA 359	7EEE 7E8344	720	JMP 33604
7E57 16FEC9	550	LBRA @LOOP	7EF1 12	730	@ENDCOPY NOP
7E5A 8E0100	560	@CSAVE LDX #256	7EF2 4155544F52554E20	740	@TEXT FCC "AUTORUN"
7E5D BF01E7	560	STX 487	7EFA	750	END @START

When the game's over, says Richard Hawes, press your Atari controller into programming service.

The working joystick

There are two main controllers in use on the Atari system — joysticks and paddles. The most obvious and frequently used application for them is as games controllers. Any game is so much easier to play with a joystick and therefore much more fun — and at around £7 each, they are cheap.

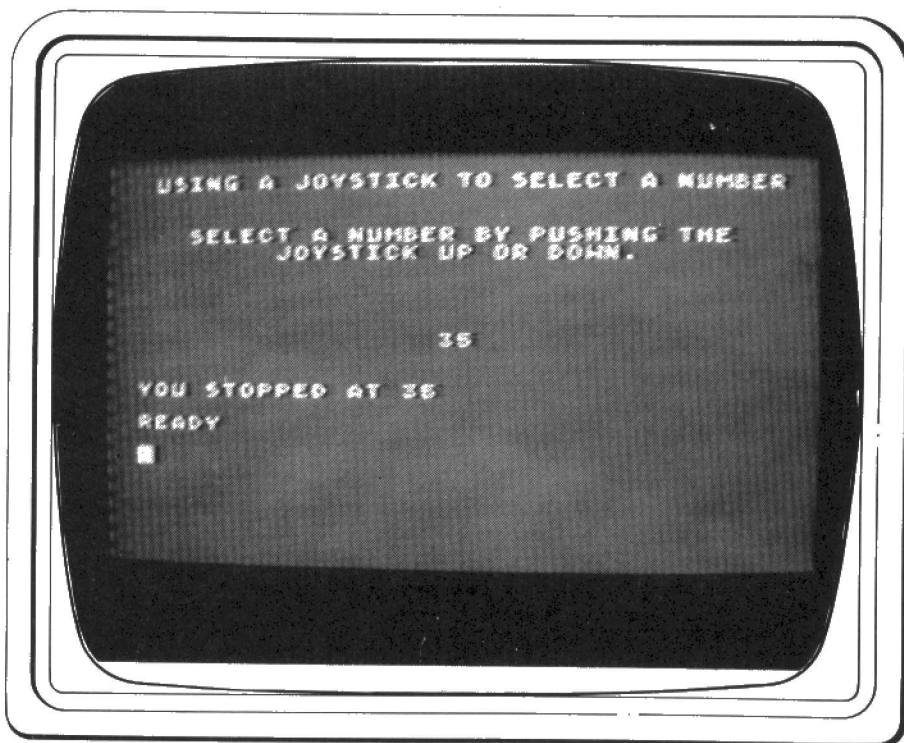
But why limit the use of joysticks to games? Surely their ease and simplicity of use make them suitable for a much wider range of applications.

The Atari 400 and 800 computers have four controller ports on the front, accessed through the PIA chip. Data can be sent to or read from the ports for controlling printers, robots etc, and of course games.

The joystick has nine positions including the resting place (see *Figure 1*, page 23) as well as a fire button. There is just one controller per lead, allowing a minimum of four joysticks to be connected at one time. Each joystick position has a corresponding number (*Figure 1*). This number is the one that will be returned when you use the basic command `STICK`. The following Basicline will tell you which position the joystick 0, the leftmost joystick, is in.

```
10 ?STICK(0):GOTO 10
```

The paddle consists of a knob on a base and a fire button. The knob can be rotated almost a full circle. There are two paddles to each port allowing up to eight paddles to be connected simultaneously. The paddle will return a number from 0 (far right), to 228 (two thirds to the left and onwards).



The number in the centre of the screen is generated by the joystick using Program 1.

The command for the paddle is similar to that of the joystick but they are numbered from 0 to 7 (left to right).

```
10 ?PADDLE(6):GOTO 10
```

In most applications programs it would be easier to move a control cursor around the screen with a joystick than with arrow

keys or special control functions.

Most utility programs are now menu-driven. They give you a list of options to choose from and ask you to select one. Some only require you to answer a number of questions with yes or no answers.

This sort of program could ideally use joysticks to make all the selection processes easier.

The programs presented here show a couple of ways in which joysticks can be used for applications programs. The first simply increases and decreases a number that is displayed on the screen just by pushing the joystick up or down. This sort of routine could be used to set up parameters within a range of numbers.

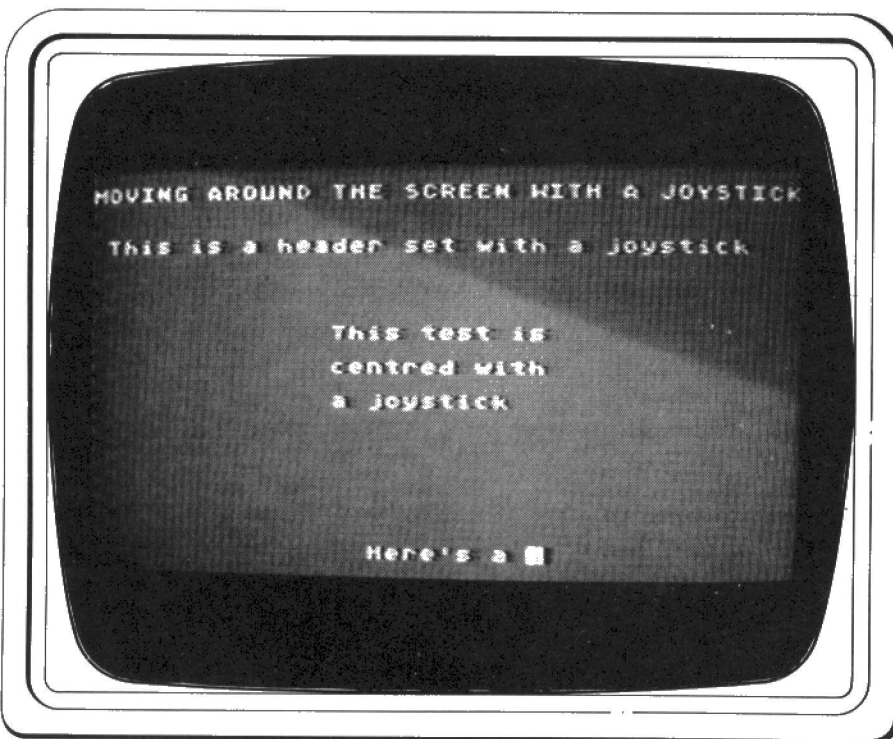
The second program uses the joystick to move a cursor around the screen, at any point pressing the button on the joystick will allow you to type in a string of characters at that point. This sort of cursor movement could be put to good use in programs such as word processors and other text editors.

Of course, the possibilities do not end there. There are many other uses for joysticks within applications programs but these options have yet to be exploited.

Program descriptions

PROGRAM 1

This program simply displays a number on the screen which you can increase or decrease with the joystick. Pushing the button will result in the program stopping and displaying the final number on the



The text on this screen has been generated using the joystick to position it. The joystick control was generated by Program 2.

screen. In a proper program that number would then be used for another purpose.

Lines 10-30— Selects display mode zero, switches off the cursor and displays the program title.

Line 40— Place number on screen (including a couple of spaces to blank out any figures when the number gets smaller again).

Line 50— Place position of joystick in a variable Y.

Line 60— If the button is pressed go to the end of the program.

Lines 70-80— Add or subtract 1 to the number, X, depending on which way the joystick was pushed.

Line 90— Delay to slow down the changing of the number.

Line 100— Sends computer round and round the program until the button is pressed.

Lines 110-120— Display final number and turn cursor back on before the program ends.

PROGRAM 2

Line 9— Opens a file to the keyboard so that keys can be read in without INPUT.

Line 10— Sets up mode zero, make left margin set at zero, turn off the cursor and display program title.

Line 20— Store a joystick position in a variable S.

Lines 30-40— These lines of logic make DX = 1 if the joystick is in any of the downward positions and -1 if the joystick is in any of the upward positions (upper left, top and upper right) and the same for DY in the left and right positions.

Line 50— Changes the X and Y co-ordinates that are used to position the cursor on the screen.

Line 55— Checks to see if the joystick button is pressed. If it is, then the program jumps to a routine which allows you to put text on the screen.

Lines 60-90— Make sure that the border limits of the screen are not exceeded.

Line 95— Find out what is the current screen location so it can be put back there after the flashing cursor routine has finished.

Line 100— Because we have turned off the cursor in line 10 to clean up the display we must create our own. This line does this. Place an inverse space at the current position (CHR\$(160)), pause for a short while so that the white flashes on for longer than the background, making it easier to see. Then backspace one place (CHR\$(126)) and place the original character back in its starting position.

Line 110— Completes the program loop.

Line 120— Turns the proper cursor back on and makes sure that there is no rubbish left where the cursor was stopped.

Line 130— Waits for a key to be pressed.

Line 140— If the key that is pressed was the RETURN key then switch off the cursor, clear any garbage and return to joystick movement routine.

Line 150— Prints whatever character was pressed and goes around again.

PROGRAM 1

```
2 REM ** JOYSTICK DEMO TO SELECT A **
4 REM *** NUMBER AND THEN USE IT. ***
6 REM **COPYRIGHT R.A.HAWES JUL '83**
```

```
10 GRAPHICS 0:POKE 752,1:? :? " USING A
    JOYSTICK TO SELECT A NUMBER"
20 ? :? :? " SELECT A NUMBER BY PUSHING THE"
30 ? " JOYSTICK UP OR DOWN."
40 POSITION 19,10:? X;" "
50 Y=STICK(0)
60 IF STRIG(0)=0 THEN 110
70 IF Y=14 THEN X=X+1
80 IF Y=13 THEN X=X-1
90 FOR T=1 TO 50:NEXT T
100 GOTO 40
110 ? :? :? "YOU STOPPED AT ";X
120 POKE 752,0
```

PROGRAM 2

```
2 REM ** JOYSTICK DEMO TO POSITION **
4 REM ** TEXT ON A SCREEN **
6 REM **COPYRIGHT R.A.HAWES JUL '83**

9 OPEN #1,4,0,"K:"
10 GRAPHICS 0:POKE 82,0:POKE 752,1:? :? "MOVING
    AROUND THE SCREEN WITH A JOYSTICK"
20 S=STICK(0)
30 DX=(S=5 OR S=6 OR S=7)-(S=9 OR S=10 OR S=11)
40 DY=(S=5 OR S=9 OR S=13)-(S=6 OR S=10 OR S=14)
50 X=X+DX:Y=Y+DY
55 IF STRIG(0)=0 THEN GOSUB 120
60 IF X>39 THEN X=0
70 IF X<0 THEN X=39
80 IF Y>23 THEN Y=0
90 IF Y<0 THEN Y=23
95 LOCATE X,Y,Z
100 POSITION X,Y:? CHR$(160);:FOR G=1 TO 10:NEXT
    G:? CHR$(126);CHR$(Z);
110 GOTO 20
120 POKE 752,0:? CHR$(32);CHR$(126);
130 GET #1,A
140 IF A=155 THEN POKE 752,1:? " ":RETURN
150 ? CHR$(A);:GOTO 130
```

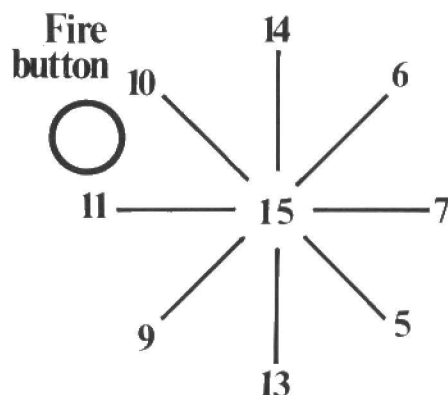


FIGURE 1: These are the nine positions of the Atari joystick and the fire button. A number is returned when you use the Basic command STICK. Program 2 also relies on these positions but uses POSITION X,Y to aid in allowing the joystick to control the position of text.

Before Basic-G the Sord M5's true abilities were hidden. Trevor Jones looks at the new language

Basic-G sharpens Sord's capabilities

The Sord M5 has an impressive range of abilities, but the Microsoft-like Basic-I that comes with the machine doesn't really allow you to get to grips with them. Now, the Basic that Sord has designed to do the job is here, in the shape of Basic-G.

Basic-G is a ROM-based language which has all the facilities offered in the Basic I that comes as standard with the Sord. But it also contains plenty of graphics-handling features, so Sord describes it as 'an easy Basic for games creation'.

Features

With the Basic-G cartridge installed you can scroll the screen in four directions, and insert and delete characters. In addition, you can control the position of the cursor by using the various control codes.

Four screen modes are available, two of which are for graphics — G1 and G2. G1 and G2 give 24 lines by 32 columns with each character being defined by an eight by eight matrix.

In the G1 mode you can access the graphics characters available on the keyboard. The G2 mode allows full accessibility to the 32 movable sprites which are user defined characters.

While using the G2 mode the screen can be split into three separate areas — top, middle and bottom. Both G1 and G2 modes allow the characters to be coloured with one of 16 colours, and also set the background and foreground colour.

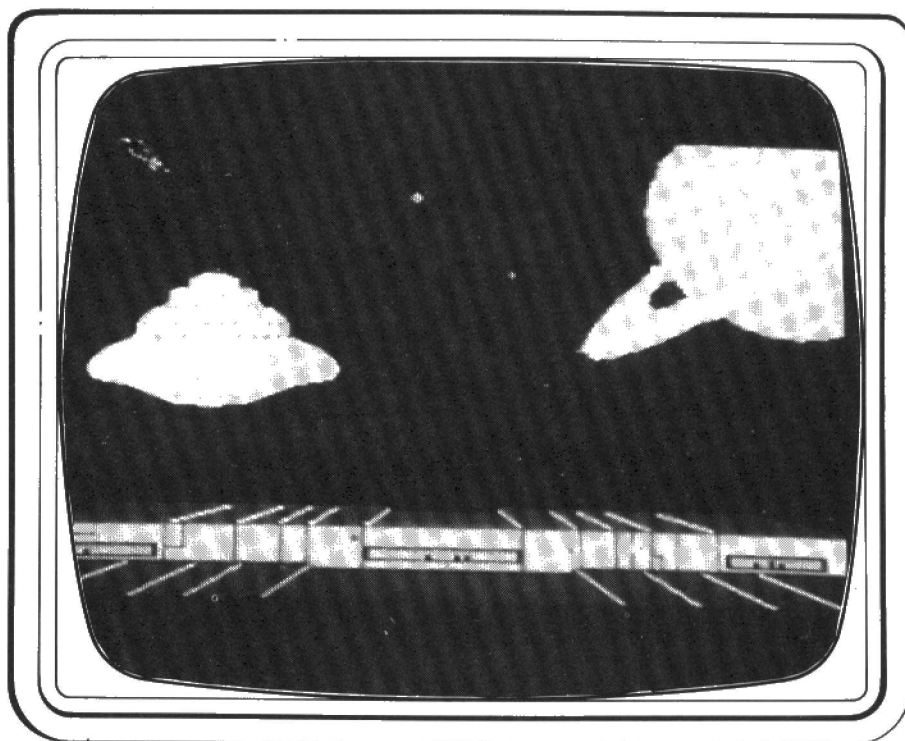
The multi-coloured mode allows mosaic graphics to be produced using an eight by eight matrix, but the graphics are somewhat limited.

The final mode is the text mode, which consist of 24 lines by 40 columns, where the characters are defined by an eight by six dot matrix. Graphics capability is poor, but this mode contains more characters than any other mode.

Two screens are featured on the M5. These are designated as screen zero and screen one. Only one screen can be seen at any time, but by using the various control codes you can alternate between the screens and also write to the hidden screen.

It's also possible to have both screens in different modes, with the exclusion of the multi-colour mode and the G2 mode. Easy animation is achieved by having expanded screen buffers.

Where a character is displayed on the various screen buffers in a slightly different position, you can create the illusion of movement without any jerks.



A demonstration of the impressive graphics displays available under Basic-G.

Basic-G is strong on sound facilities. The language allows you to use normal music notation — so all the usual symbols such as sharps, flats, dotted notes, rest triplets and tempo are available to be used over the Sord sound generator's three-channel, six-octave range.

Arcade-style sound effects can also be produced using the tone generators and the noise generator.

The Sord M5 has powerful interrupt handling abilities, and Basic-G allows six different interrupt statements to handle various types of interrupts, which are external events that cause the CPU to pause in whatever task it is executing and attend to the event, then resume its previous task.

The machine also has a built-in timer that can be used in a Basic-G program to produce a set delay or to suspend a task for a specific amount of time. But one feature sadly missing from this language is floating point mathematics.

Presentation

Basic-G comes as a ROM cartridge, securely held in an A4 size plastic case. The 284 page manual sits on top of the cartridge, making the weight of the package quite substantial.

Documentation

The instruction manual is well written, clear and concise. It provides a good comprehensive index which makes information finding very straightforward. The appendix is also useful, giving such details as error codes and their meanings.

No memory map is given. The manual briefly mentions the use of the call statement, but provides no further information. Therefore, machine code addicts don't have any way of finding out where routines start, and what those routines are.

Getting started

Getting hooked up is a one-minute job — after that, Basic-G is fairly easy to learn, and the use of the commands is reasonably obvious. In addition, the manual is a good hand holder, providing good but simple examples with some diagrams.

In use

Graphics One of the exercises the manual leads you through is to create a flying saucer, colour it and move it across the screen. This can be done in just seven lines of code:—
10 print "USL"


```
20 stchr "00183c66db7e2400" to &7F,0
30 scod 0,&7F
40 scol 0,&C
50 loc 0 to 0, 100
60 move on
70 move 0 in 0 220, 136, 2
```

You use a plot statement to display pixels, followed by the co-ordinates of where you want the pixels to appear.

Circles are produced using a circle statement followed by the radius of the circle, which is the number of dots. Drawing an ellipse is done in a similar way, using the circle statement, but this time both the radii in the x and y directions have to be specified.

Drawing squares and rectangles is done by using the box or bar statement. The box statement is followed by four parameters, each separated by a comma. The first two parameters refer to the upper left corner of the rectangle, and the remaining two refer to the lower right corner rectangle.

You can also paint or colour an enclosed area by specifying a set of co-ordinates within the area you wish to colour. Here are a few lines of code to do this:

```
10 print "URL"
20 ginit
30 gmove 130,110
40 circle 70
50 fcol 8
60 paint 130,100
70 fcol 5
80 paint 10,10
```

Sound It took me five minutes to transcribe a piece of sheet music for a popular song using the normal musical notation that's found in the Basic-G language. If you're not very good at music, that's no problem since you can use numbers instead to denote the musical notes.

Verdict

This package has a lot to offer; it's easy to use, and provides the user with the means

Sample Basic-G graphics, sound and interrupt handling commands

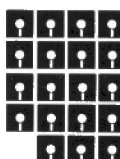
MAG	MAG ((sprite-modifier)) (CR :) Change the sprite size and format.
SCOL	SCOL(sprite-number), (colour)(CR :) Colour sprite-number using colour code.
STCHRE	STCHRE ((character-set-selection)) (CR :) Select character set to be used as specified by character-set-selection.
LOC	LOC(sprite-number) TO (GR-coordinates) (CR :) Move sprite-number to the specified GR-coordinates.
JOINT	JOINT((sprite-number-1) TO (sprite-number-2)), (link-position)) (CR :)

of handling graphics simply and easily, without too much sweat. The graphics offered are very good and the overall performance of the software is fine.

However, my main reservation is its price. At around £35, Basic-G is not sufficiently keenly priced to make much impact on the market.

I'm also disappointed to see that there's no floating point maths provided — this is a serious drawback for many users. Indeed, it's essential for serious games writers. All in all, anyone buying this package should find plenty of scope for entertainment, as well as a good Basic for serious applications. But until Sord brings out a version with that vital floating point ability thrown in, Basic-G doesn't get top marks.

RATING
Features
Documentation
Performance
Reliability
Value for money



EVENT	EVENT (interrupt-interval)((, (delay-time)) (CR :) Set the interrupt interval accessed by the ON EVENT GOTO statement.
ON ALARM	ON ALARM GOSUB (line-number)(CR :) Call subroutine beginning at line-number when the alarm is set off. (Interrupt priority 1).
PLAY	PLAY ((melody-1))((, (melody-2))((, (melody-3)) (CR :) Play melodies 1, 2 and 3 concurrently to create harmony.
SG	SG (channel-number), (((frequency) (noise)))((, (volume)) (CR :) Turn the three tone generators and noise generator on and off, and produce sound effects.

Name Basic-G Application Programming language System Sord M5 Price £34.95
Publisher Sord Computer Format Cartridge
Language Basic Outlets Sord, and Computer Games Ltd

SECOND OPINION

Basic-G will do a lot for people's ambitions. Not content with having both an easily-learned language (like slow old Basic) and fast games in the shops, users will always want to write their own arcade hits.

Basic-G gives them a chance by providing an easy way to access the sophisticated hardware features on the Sord M5. Similar products have existed before . . . Texas Instruments' extended Basic cartridge for the 99/4A, for example — although it isn't such a 'polished' version. Basic-G has everything built in. TI extended Basic works through sensible but cumbersome CALL subroutines.

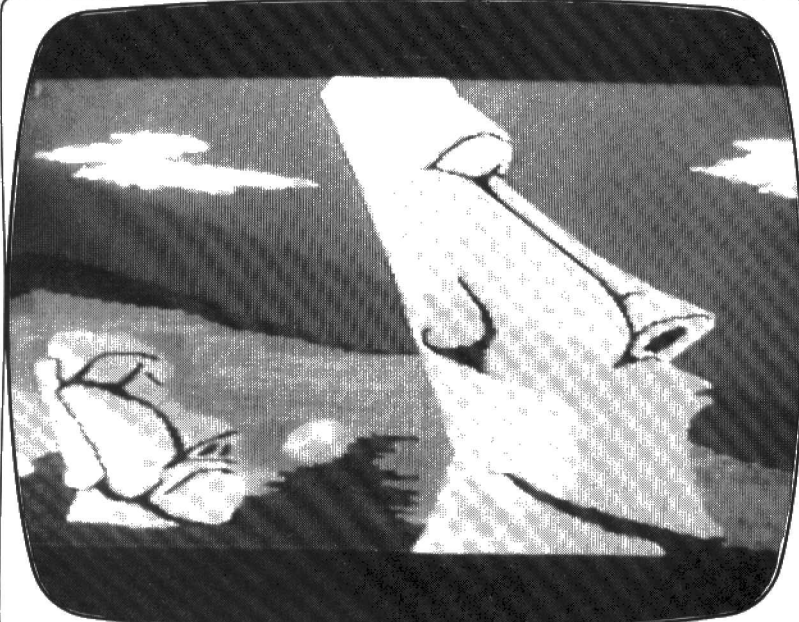
So Basic-G isn't particularly new or startling. It is just plain sensible. And it is nice to use. Sprite graphics are very different from the ordinary way most micros force you to do animation. Basic-G simplifies things because you can just try out commands in 'immediate mode' and see what happens. Coupled with the effective screen editor for repeating and copying commands, sprite graphics should be easy to pick up.

The absence of floating point maths is a real letdown. You can get round it in games programming, but this is supposed to be a luxury Basic. Everything else — sound support, interrupt support and a workable manual — suggest it is.

The M5 with Basic-G is a great way to learn about sprite graphics. And it is possible to write some effective arcade style games and totally revamp even the most mundane oldies using it. Alone, it may ensure that there is enough software available to make the machine a success.

The problem? There's only one major complaint. Basic-G should come with the M5. You can't disguise the price of the machine just by packaging it with a crude Basic and hoping people won't notice the extra £35.

Max Phillips



Ted Ball tests the Tasword Two word processor and finds it something to write home about.

Tasword Two is a word processor for the Spectrum that has been designed to work with interfaces that allow you to use a full-width printer on the Spectrum. It was tested on a 48K Spectrum with a Kempston Microelectronics parallel printer interface and an Epson MX80 printer.

Features

Because it has been designed to work with full-width printers, Tasword Two gives you 64 characters to a line, by redefining the Spectrum character set so that all the letters are half the usual width. Most of the half-width characters are easily recognisable, but some, like capital N and capital Q, look a bit odd and take a while to get used to.

Tasword Two is basically a full-screen editor with some additional formatting and other features. To enter text into the computer you just type from the keyboard in the usual way. You get automatic 'word wrap' and right justification, so that when you type a word that is split between the end of one line and the beginning of the next the whole word is moved to the second line, and extra spaces are put in between the words to give a neat right-hand margin.

You can, however, switch off these features.

To make changes in your text you move the cursor to where you want to make the changes, using the normal cursor keys to move up, down, left and right through the text, or additional commands to move left or right one word at a time.

Typing in new text will overwrite what was there before, but there are commands that allow you to insert or delete lines or characters.

After you have edited your text you are likely to end up with an unjustified right hand edge where you have deleted words or inserted a short line, so there is a command that will re-format a whole paragraph, closing up gaps and justifying the lines.

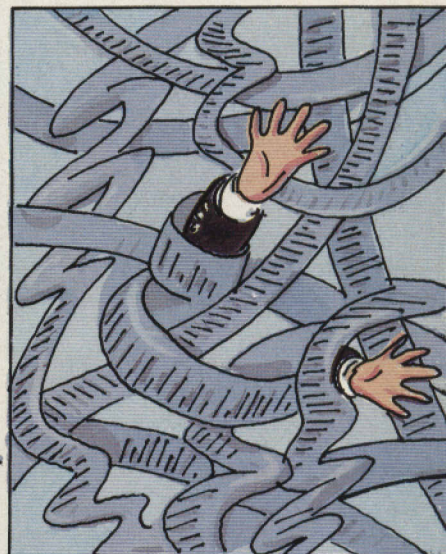
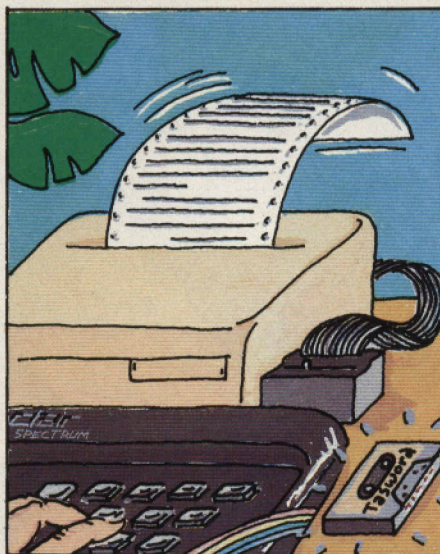
Other features allow you to scroll through your text backwards or forwards, one line or a whole screen at a time, find or replace text, move or copy a block of text, load and save text files on tape, and print text on the ZX Printer or on an ordinary printer.

There are also two Help screens you can call that give a summary of all the commands, and a text file containing a tutorial to help you get started on Tasword Two.

Presentation

Tasword Two comes on a clearly labelled cassette, containing the word processor program and the 'Tasword Tutor' text file. There is also an instruction booklet that was copied from text prepared with Tasword Two and printed on an Epson FX80 printer.

The instructions are fairly concise and intended mainly for reference, since the Tasword Tutor tape file is provided to teach you how to use the program.



Eric Pateman

Spectrum text

However, there are some additional hints and tips, and you need to read part of the booklet before you start using Tasword Two.

Getting started

If you are using Tasword Two with a ZX Printer all you need to do is load the tape and start typing. With other printers you have to start by configuring Tasword Two for your printer interface and printer, by incorporating into Tasword Two a customised version of the printer driver software that comes with your printer interface.

There is a separate leaflet with the instruction booklet that gives instructions for configuring the printer software for the Cobra, Euroelectronics, Kempston, and Hilderbay interfaces.

Tasword Two will automatically provide the control codes you need to run an Epson FX80, but for other printers you have to look up the control codes in the printer manual and put them in yourself, following the prompts given by the program. You only need to configure Tasword Two once; after you have set it up you can save a copy with the printer software included.

In use

Tasword Two is fairly easy to use, and it constantly displays some useful information in the bottom two lines of the screen, telling you whether features like word-wrap, line justification, CAPS LOCK, etc, are on or off. Some of the features, like load, save and print a text file, and search or replace, give you prompts for the information needed to operate them.

The search and replace, and the block copy and block move are fairly slow, and there is no message to tell you that anything is happening.

Reliability

Tasword Two is very reliable in normal use, but you have to be careful when using a

printer. There is no problem with the ZX Printer as all you can do is print the whole text file, but with other printers you can specify the line-spacing, and a start and end line to be printed. If you put in silly values like a line spacing of 0 you will find that the computer hangs up, or the printer does odd things. You can also find strange things happening if you have not set up the printer control codes properly.

Verdict

On the whole, Tasword Two is a fairly good word processor with excellent editing features, but rather limited in the amount of formatting that it allows. The fact that it has been designed to work with the printer interfaces that are currently available for the Spectrum gives Tasword Two a distinct advantage over other word processors available.

With Tasword Two, a full width plain paper printer, and an add-on moving-key keyboard the Spectrum can be turned into a useful system for small-scale word processing, although the add-on keyboards I have seen for the Spectrum are not good enough for touch-typing, and the limitation in Tasword Two to 64 characters to a line may make it unsuitable for some applications.

RATING

Features

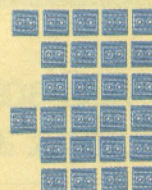
Documentation

Performance

User interface

Reliability

Overall value



Name Tasword Two **Application** Word processor **System** 48K ZX Spectrum **Price** £13.90 **Publisher** Tasman Software, 17 Hartley Crescent, Leeds LS6 2LL **Format** Cassette **Language** Basic and machine code **Outlets** Mail order, some retail shops and printer interface manufacturers

For big BBC storage in a small package, Geof Wheelwright spins the 3in microfloppies from AMS.

Shrinking disks



The technology behind Advanced Memory Systems 3-inch disk drives doesn't bear much relation to the new low-cost storage medium from Sinclair, except that both can store about 100K and represent significant shrinkages in the physical size of storage on popular micros. The AMS drives use the new Hitachi 3-inch disk drive with disks encased in goof-proof plastic containers.

Features

The AMS drives can hold 100K per side (the disks are dual-sided, but they have to be turned over like audio records — you can't write to the second side without turning them over). The drives come in two configurations: a £225 single drive or a £399 dual drive unit with both drives boxed together. We tested the dual drive version.

The drives are 40-track, with average speeds of 300 rpm and an average data transfer rate of 125 kilobytes per second for single density disks, and 250K per second for the double density. AMS claims an average access time of 55 milliseconds for the drives (which are actually made by Hitachi as the Compact Floppy Disk Drive HFD 305S).

The drives have a minimal power consumption and plug into the disk drive power points underneath the machine. You don't need extra power to run them — unlike some of the large dual drives such as Torch's Z80 Disk Pack.

The disks themselves can be write protected using a switch on the outside of the plastic casing — a great relief for traditional disk users who have the little sticky tabs needed to protect ordinary floppies.

Documentation

The documentation for these drives does the job, but the 80-page size of the manual is a little misleading — the whole of Chapter 4 (or 30 pages) probably looks a little familiar. It's lifted almost word for word from Acorn's DFS manual. But don't blame AMS for this — Acorn won't sell the DFS manual with their £95 disk interface upgrade. You don't get it unless you buy Acorn drives. So everybody who makes drives for the BBC and uses Acorn's interface has to reproduce all the DFS documentation and commands.

The manual gives a good — if all too brief — explanation of the Hitachi microfloppy disk drive standard and a comprehensive

The 3-inch floppy (left) comes in a hard plastic case and features an automatically retracting steel shutter to protect the disk surface. The microdrives themselves (right) are small enough to stand on the BBC Micro. No extra power supply is needed but a DFS chip and utility EPROM need to be installed.



chapter on setting up the drives. There's also a nice, useful chapter on machine code handling and the DFS with the Hitachi drives. It even documents entry points for OSGBPB and OSWORD(A=7F) that aren't included in the BBC Micro User Guide.

Chapter Six is full of technical information including formatting, 18-bit addressing, background on the 8271 disk controller chip, the keyboard links and the drive specifications.

In use

The drives were easy enough to hook up to the BBC, allowing for the usual tense moments when you have to install a sideways ROM chip on the Beeb. The drives are connected via a standard cable to the disk connector beneath the machine and the power plug goes into the standard disk drive power socket. But the system also requires the installation of a utility EPROM containing the *FORMAT and *VERIFY programs. If you've never plugged an EPROM in your machine, take care not to bend the pins and make sure the notched end of the chip is facing away from you.

In operation, the disks proved as fast and reliable as either the 40- or 80-track Acorn disks I've used. Although they didn't respond too well to the 90 degree weather during one of the weeks of my test, this is hardly normal weather for the UK, so I'd give the drives the benefit of the doubt.

The cables that come with the drive are long enough to allow it to sit either on top of or beside the BBC, but only to one side. A longer cable would provide a little more flexibility in this respect.

As to the new media and whether the 3-inch Hitachi disks will win the battle of standards with the Sony 3½-inch microfloppies, Sony looks to be a strong contender in this respect, as it has the backing of Shugart and several other big industry names. Shugart produces the SA300 3½-inch microfloppy, offering 80 tracks per surface and the same rotating speed as Hitachi's drives — 300 rpm.

However, the fact that big media manufacturers such as TDK are backing both horses in this standards race indicates that there won't be a clear winner for some time to come. TDK recently announced plans to produce disks for both the 3-inch and 3½-inch drive systems — and Hitachi's own not insubstantial facilities are also producing disks, so you aren't likely to be left with an obsolete drive system anytime soon.

My big question about the drives was one that couldn't really be answered by using them: once you spend the £399 for the dual drives, the £30 for the ROM and utilities disk, £30 for the cables and documentation — are you going to be left without a large software base?

Acorn and other third party software houses seem to have enough trouble supplying 5¼-inch disk software without having to worry when they're going to have 3-inch microfloppy software ready.

Only a few major software houses — including Gemini — have so far announced plans to produce microfloppy software, with the balance obviously waiting to gauge the public's reaction to the drives.

Verdict

The AMS drives certainly don't represent any kind of price breakthrough — they still fit roughly in the £1 per K of storage formula that seems to be the norm for drives these days. But the microfloppies' design makes them far more durable and easy to handle than normal drives — without any appreciable loss in speed.

Given that there's not much of a price difference between the AMS-Hitachi drives and most 5¼-inch drives for the Beeb, your own criteria will have to depend on how much you value the space around your machine and how pioneering your spirit towards new technologies.

Convenience of use and ease of handling might also prove a winning point for these drives, as the protective sleeve and hard plastic exterior provide far greater protection for your disks than any conventional floppy systems.

In the first of a two-part examination, Ian Scales opens up the long-awaited Microdrives.

Driving the ZX Spectrum

Mass storage has always been the weak link in the sub-£200 micro range. Until now there has been no useful alternative to cassette recorders except disk drives — and as these take the cost of your system well above the £200 mark they can hardly be termed an alternative in any case.

Sinclair's ZX Microdrive has been designed to provide an intermediate technology between the two, providing rather better access speed and file handling capabilities than the pedestrian cassette recorder, while keeping the price in line with the micro it serves.

The drives

The Microdrive itself is about the size of an average fist. The real surprise is the Interface 1, cleverly designed to sit under and slightly behind the Spectrum. As well as connecting the Microdrive through a short length of ribbon cable, the Interface 1 enables you to set up a network of computers and send information from one to the other.

Sinclair has thoughtfully prevented the Interface 1 and Microdrives being wobbly and unreliable appendages by providing screws so that the interface can be fastened securely to the body of the Spectrum, preventing periodic system-crash. You will have problems, however, if your Spectrum is cased in a 'real' keyboard.

The drives, too, can be fastened together. You can have up to eight drives chained: each

drive, however, can only be used alone, and the drive must be identified by a rather tortuous set of commands to get it going.

The drives and the interface are very light — you can envisage someone producing a small carry case to transport the system around. Indeed, with the potential of the Interface 1 wouldn't mind betting that we are likely to be deluged with a host of interactive games. It may become the vogue for game players to get together with their respective Spectrum systems for an evening's entertainment.

The cartridges

The Microdrives use endless loop cartridges (see illustration) with a tape width of five millimetres. The cartridge is about the size of an average ROM chip and contains about 16 feet of tape which is dragged past the magnetic head in the drive at about 30 inches per second. Our timings indicated about 10 seconds for the tape to run through.

Sinclair says the access time to load a 48K file can be as little as 3.5 seconds. This assumes that it's right at the beginning of the tape. Even if it's at the end, 10 seconds is a vast improvement over the ordinary cassette.

The 100K cartridges come unformatted. The formatting routine takes about 30 seconds, because it involves several tape circuits to first write the block header and lay down the check-sums, then go back to read them over a couple of times, and finally identify suspect tape areas and 'rope them off' from the system.

Sinclair says there should never be less than 85K available — the actual amount is displayed at the end of the routine.

Once formatted each car-



The cartridges use a 20-foot loop of very thin tape. The tape lives on a single spindle enclosed in the cartridge. As the tape is driven over the magnetic read/write head it unwinds from the middle of the coil of tape and is wound back onto the outside.

The system has been designed to sit loosely on the spindle so the tape can escape easily — even so, logic suggests that the flimsy tape undergoes considerable stress at the speed with which it is run, especially as it has to turn at right-angles as it passes over the coil. Sinclair claims it will last 5,000 accesses, but also recommends that important data be backed-up on a second cartridge.

At this stage of testing we have experienced no physical tape failure but only time will tell how reliable the cartridges actually are — we're keeping our fingers crossed.

The tape is driven from the side by a mechanism inside the Microdrive.

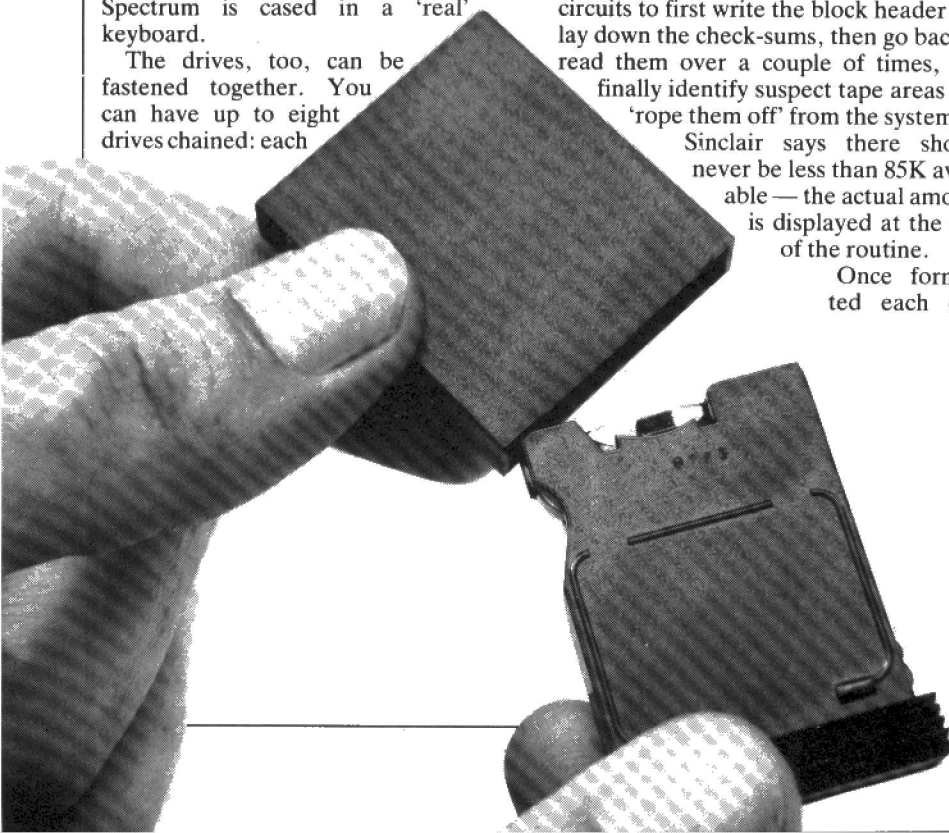
At present, the cartridges are priced at a rather expensive £4.95, but at least you can buy as many of them as you like. This endless-loop cartridge system is no remarkable breakthrough in a technical sense. The concept has been around for some time as the 'stringy floppy'. But presumably Sinclair has refined the technology to the point where it is reliable and cheap to manufacture.

tridge can contain up to 50 files. Syntactically, the easiest procedure is to catalogue a cartridge. This only requires a couple of keystrokes and a seven to 10 second wait (see chart, page 38).

The operating environment for the networking system and drives is understood by the user as a series of channels and streams. Put simply, the channels and streams are conceptual ways of moving data around the system.

The channels consist of the screen, ZX Printer, Microdrive files, another ZX Spectrum (using the interface network) and the RS232 interface to a standard printer or modem. These are the output channels. Input channels are then obviously the keyboard, Microdrive file, another Spectrum and the RS232 interface.

The 'streams' are the routes to these channels: there are 16 of these numbered 0 to 15. The first four are linked to various channels, but the remaining 12 can be



Microdrive delusions

When Sinclair's Spectrum was launched in April 1982, there was much hoopla about the 'soon-to-be-available' cheap disk drive for the machines.

As it turns out, the Microdrive was neither available soon nor a real disk drive. It was launched last month and turned out to be a floppy tape with limited serial access — not the random access disk pack everyone had put their sights on. But it's probably not Sinclair's fault — after producing the ZX81 and the Spectrum, many people expected the impossible; random access drives for under £100.

Another expectation was that the operating system in the Spectrum was already set up to support the CAT, CLOSE, DELETE, ERASE, FORMAT, MOVE and OPEN commands on the Microdrives. Again the original impression was wrong — the Microdrive interface module that you have to buy to run the drives actually contains the operating system.

Sinclair Research itself has always been

slightly more modest (read realistic) in its claims about the Microdrives, largely because the drives had been undergoing slight design changes all the way along.

Sinclair claimed that: 'Each Microdrive is capable of holding up to 100K using a single interchangeable microflop... All the Basic commands required for the Microdrives are included in the Spectrum.'

The big question was: What did they mean by microflop? The answer was oft-speculated, many people reaching the correct conclusions about the impossibility of a 'real' disk drive and surmising that it would have to be a floppy tape or stringy floppy instead.

The real surprise is not in the drive itself but in the expansion module developed to interface the drive with the Spectrum. The £30 expansion module also gives you motor drive control over cassette-tape storage, a plug-in for local area networking and an RS232 interface.

The communications facility lets you

network as many as 64 other Spectrums at baud rates as high as 9600 and as low as 50.

The inside word from a prototype Microdrive user is that the RS232 interface had some development problems, but if it proves to be reliable in the long-term it will be a great complement to the Microdrive. Imagine a small business using the Spectrum with a wordprocessor or spreadsheet in ROM (using the cartridge software Sinclair plans to release for the Spectrum) combined with two Microdrives for storage, a network connecting perhaps other desks in a small office, and dot-matrix or even daisywheel printers running through the RS232.

Sinclair has also said it soon plans to release software on Microdrives, in addition to the existing base of cassette software and the planned release of ROM software. Cassettes will likely remain the cheapest storage alternative for the Spectrum, but smaller programs can reside in the plug-in cartridges and big programs can take advantage of the Microdrive's 100K.

38 ►



◀ 34 specified in the command syntax for greater programming flexibility.

We will take a closer look at how and how well this all works in issue 25.

The network

The biggest surprise of the Microdrive release was the local area network. Up to 64 Spectrums can be connected up to 100 metres apart. Unlike some other simple networking systems, this one does not require its components to be linked into a loop. The computers on either end can't be connected to each other.

A length of cable for netting is supplied with each Interface 1 and Sinclair claims all the Spectrums in the net need not be turned on for communication to take place. The only limitation is that individual Spectrums on the net may not be turned on or off while communication is in progress.

To use the net you have to give your computer an identification number — if there are only two computers each can call itself 1, without the need for any identification commands.

Sending and receiving data involves a fairly simple series of commands. A program is sent by loading it into your own computer and SAVEing it to its destination.

To send a program or some data requires a fairly high level of interaction among the participants. Unless you are within shouting distance, some form of telepathy would appear to be necessary to get things working. For instance, there is no way of breaking into a game or application on another computer to warn of an impending transaction. Participants should ideally be facing one another.

To send down a program requires the sender entering:

SAVE *"*n*";2

The receiver has to prepare his station by entering:

FORMAT *"*n*";2

LOAD *"*n*";1.

The receiver then has to verify the correct reception of the transaction by another command.

There is also a broadcasting facility so every computer on the net can pick up a transaction — this feature is obviously particularly useful in the classroom network.

The crowning feature of the Interface 1 is the D-plug RS232 connector which gives the user access to peripherals like quality dot-matrix printers or modems. Using a printer, for instance, would seem to be a fairly straightforward procedure and we can probably soon expect a deluge of wordprocessing packages to take advantage of the situation.

Verdict

The Microdrive doesn't represent any technological quantum jump — 'stringy floppy' products of this type have been around for some time. Its importance lies in Sinclair's backing.

To be really useful, a storage medium must be tied in to software — it has, in effect, to be perceived by the industry as a

CAT 1

CAT#*z*;1

CLOSE# stream

ERASE "*m*";1; "*name*"

FORMAT "*m*"; 1;"*name*"

FORMAT "*n*";*x*

FORMAT "*t*";*x*

LOAD *"*m*";1; "*name*"

SAVE *"*M*";1; "*name*"

The commands to control the Microdrives and the networking system are tied to the Basic keywords. As can be seen from the sub-set of the commands above, this aspect complicates the syntax necessary to do quite simple operations. For instance, it takes 11 to 21 keystrokes to accomplish the oft-needed loading of a file — most of the syntax also requires continual shift changes.

Lists all the files in a cartridge in a given drive (1,2,3 and so on).

Sends the catalogue in drive 1 (or 2,3 etc) to stream *z*.

Unlinks any channel from the specified stream.

Erases the file with the specified name from the cartridge in drive 1.

Prepares a blank cartridge and gives it a name.

Sets the network station to number *x*.

Sets the baud rate for the interface (*x* can be 50,110,300,600,1200,2400,4800,9600,19200).

Loads up a named file from Microdrive 1.

Saves file to Microdrive 1.

'The crowning feature of Interface 1 is the D-plug RS232 connector which gives the user access to peripherals like quality dot-matrix printers or modems'

likely 'standard' with a substantial market available for software products making use of it before it will be supported.

Once the ball is rolling, however, it becomes very difficult to replace it with something else — so the Microdrives are likely (all being well) to follow-through on Sinclair products for some years.

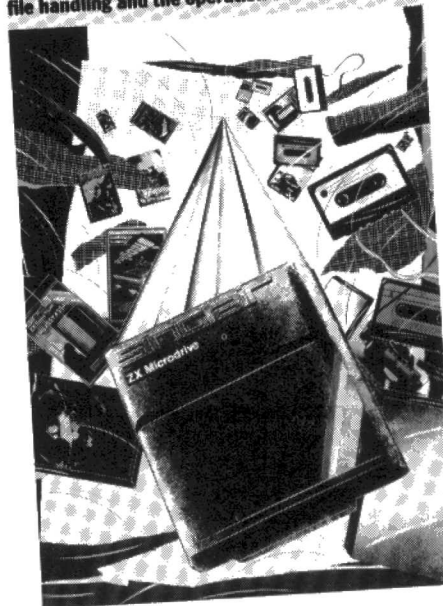
The average Spectrum owner wants to be able to run commercial games and applications on the chosen method of storage, not just load and save his own listings. The bugbear with third-party products of this type was that users found that the built-in protection, of the games programs especially, prevented them from listing and resaving on an alternative storage system.

With Sinclair's backing, the software producers are likely to market several protected programs at a time on a Microdrive cartridge. Perhaps even more

importantly, it should be possible to write significantly more flexible personal/business applications programs for the system than have hitherto been practical given the limitations of the cassette recorder.

Item Sinclair ZLX Interface £29.95 (with drive), £49.95 by itself. ZX Microdrive £49.95 per drive. Cartridges £4.95. **Available** Mail order, 2 drives and 1 Interface per customer until further notice. (Order forms are being sent to those who bought Spectrums first as supply permits.)

The PCN Pro-Test of the ZX Microdrives will continue in issue 25 when we'll report on the capabilities of the system with a closer look at the file handling and the operation of the network.



Nigel Cross gets to grips with the Tandy Model 4 and asks: Is it sufficiently different?

Family resemblance

New micros are rolling out of factories at a ridiculous speed. New companies spring up out of nowhere and launch a new computer on an unsuspecting public. If the product works, the company can suddenly find itself a market leader.

So it has been for companies such as Commodore, Apple and Tandy. Once such companies are established, you can expect them to try and retain their dominance. So they will launch new machines that improve on previous models

and beat the new competition.

With this in mind, I expected great things of Tandy's latest offering, the TRS80 Model 4.

Presentation

The Model 4 arrived in the ubiquitous sturdy cardboard box full of styrofoam packing. Moving it produced numerous problems and getting it in and out of a taxi was reminiscent of a Laurel and Hardy sketch. I recommend you persuade your

dealer to deliver the machine.

Why do manufacturers spend so much time developing a neat, compact computer and then stick it in to a great unwieldy box?

Documentation

Documentation starts with a weighty tome in a brown leatherette-like binder. This is the system manual and contains a system master disk tucked firmly into its front cover.

There's the standard awkwardly shaped

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BASIC RESERVED WORDS

@	CLOCK	DATA	ELSE	FOR	INPUT	LLIST	MKIS	PEEK	RENAME	SET	TAN
ABS	CLOSE	DEFDBL	END	FORMAT	INSTR	LPRINT	MKSS	POINT	RESET	SGN	THEN
AND	CLS	DEFFN	EOF	FRE	INT	LOAD	NAME	POKE	RESTORE	SIN	TIMES
ASC	CMD	DEFINT	ERL	FREE	KILL	LOC	NEW	POS	RESUME	SQR	TO
ATN	CONT	DEFSNG	ERR	GET	LEFT\$	LOF	NEXT	POSN	RETURN	STEP	TROFF
AUTO	COS	DEFUSR	ERROR	GOSUB	LET	LOG	NOT	PRINT	RIGHT\$	STOP	TRON
CDBL	CSNG	DEFSTR	EXP	GOTO	LSET	MEM	ON	PUT	RND	STRING\$	USING
CHRS	CVD	DELETE	FIELD	IF	LEN	MERGE	OPEN	RANDOM	RSET	STR\$	USR
CINT	CVI	DIM	FIX	INKEYS	LINE	MID\$	OR	READ	RUN	SYSTEM	VAL
CLEAR	CVS	EDIT	FN	INP	LIST	MKDS	OUT	REM	SAVE	TAB	VARPTR
											VERIFY



41 Tandy Basic manual. An extra page is included, highlighting the differences between the Model 4 and its predecessor the Model III. Finally, there's an introductory booklet describing the hardware and software features of the machine.

This is a precisely-written document showing each aspect of the machine in clear, simple words. It's just right for the first time user. The Basic manual is both a tutorial and a reference guide and is again very explicit.

Even so, I'm sure that a professional organisation like Tandy doesn't need to pack a document like this with trite, superfluous cartoon-like illustrations — a trait so common these days. Be that as it may, if you want to learn Basic on this machine, you can't really fault it.

The system manual is a totally different kettle-of-fish. Very heavy going but packed full of exact descriptions of available functions. To understand all of the facilities available within the operating system would take a great deal of time and effort for the user.

Construction

The first thing you notice about the Model 4 is Tandy's radical departure from its standard yucky cheapo silvery finish. The pristine Model 4 has an almost-white sturdy finish. It actually looks like a real computer in this style.

The on/off switch is to the right of the keyboard on the underside of the machine. Being a rocker style switch, it is quite likely to be knocked should you move the machine about your home or office. Similarly, the screen controls are hidden under the left side of the machine and are vulnerable to knocks. These are only small points but they tend to be annoying if problems occur regularly.

Fitting a printer cable revealed that connections for peripherals reside underneath the machine at the back. So making any connections involves tipping the machine on its side. Not a nice technique. The small selection of slots and holes allows various interfaces to be fitted to facilitate such things as extra disks, communications and serial I/O.

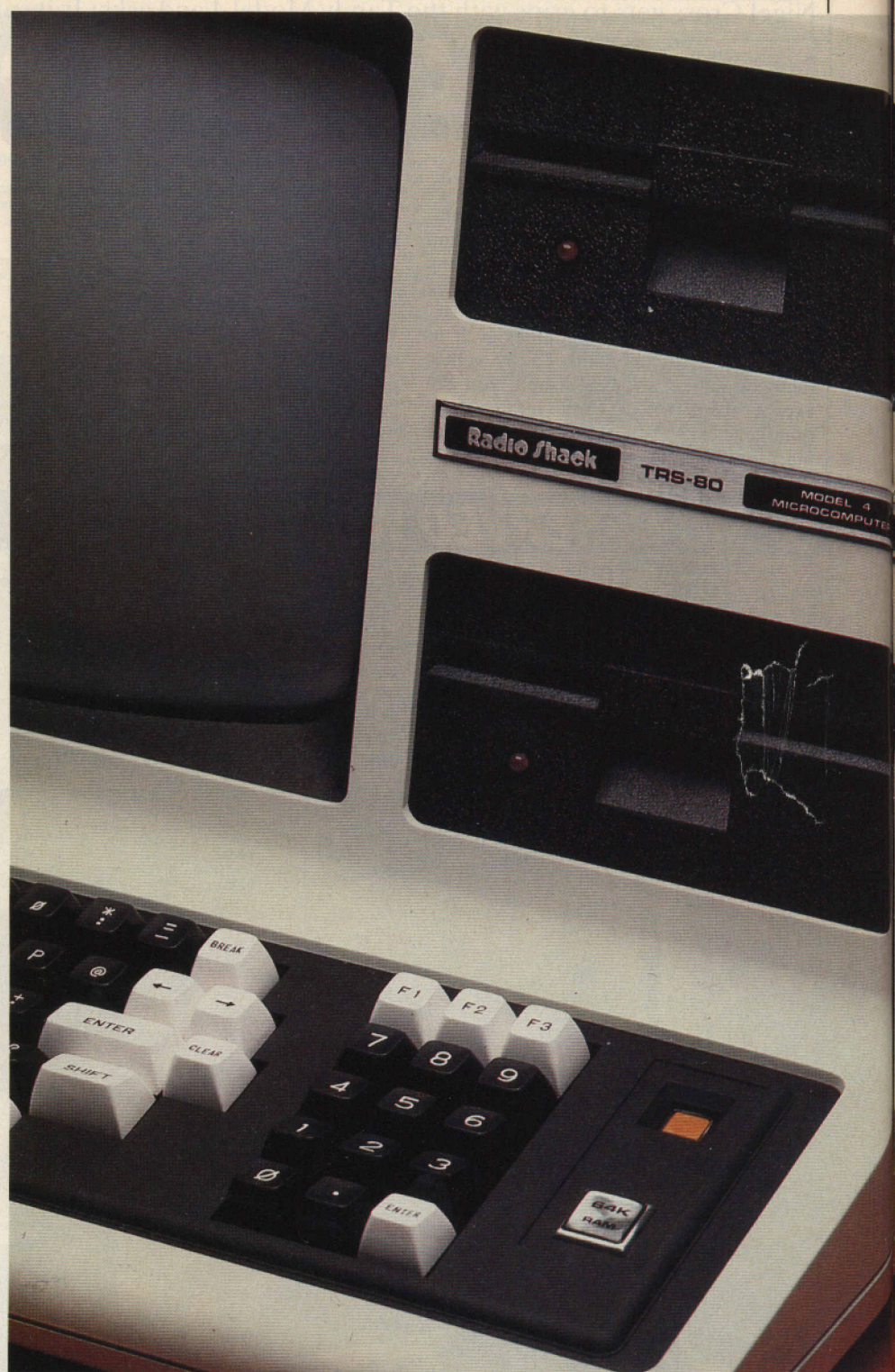
Keyboard

This is a standard Tandy keyboard. I would have preferred more feel to it; interaction with any computer involves a fair amount of keyboard use and it is apparently an area that manufacturers care little about.

Why can't manufacturers contrive to provide keyboards that feel comfortable, and have easy-to-use convenience keys such as cursor controls? Admittedly, the Model 4 has four cursor keys, a numeric keypad and three function keys but I failed to find any way of using the function keys from within a user program.

Screen

The Model 4 is the first Tandy to be blessed with an 80-column display. This is a radical departure for Tandy, a company that has been adamant that 64 columns was perfectly adequate. Obviously, the plethora of



competitors offering 80 columns has forced Tandy's hand somewhat.

Although the Model 4 has an 80-column display, facilities exist to run existing Model III software using the screen in the same old fashion.

However, I was not impressed by the woefully limited graphics capability. It provides 160×72 graphics using pixel characters. You could be more adventurous with a Spectrum!

Tandy could even have used some of its Color Computer circuitry in this machine.

Operation

The Model 4 runs under an upgrade of Tandy's well-used TRSDOS known as

Version 6. There is nothing startling about TRSDOS 6 as the changes are pertinent only to the hardware changes on the new machine.

As it is, the Model 4 is essentially a business machine and should be compared to machines of a similar ilk such as the Apple IIe and larger Commodore systems. The Tandy is not overpriced with its 64K RAM, twin 184K floppies, screen, keyboard and printer interface costing about £1,500.

I was particularly impressed by the data communications facilities available in TRSDOS 6. I've spent many years working in comms and if some of the mainframe manufacturers had included only half of

Left: The Model 4 with twin 184K floppies. The lowest-level option, cassette-based, features a blank panel here. Further disk drives can be added externally.
Bottom: Expansion connectors with at bottom right, the parallel printer connection, floppy disk expansion connector, and bottom left, the RS232C connector and I/O bus jack.

Left: the power plug and cassette connection at the rear of the unit.
Below: The 70-key keyboard with function keys, numeric keypad and cursor controls.



TRSDOS commands

Initialisation

FORMAT AUTO BOOT DATE
FORMS SETCOM SETKI
SYSGEN SYSTEM TIME

Auxiliary

DEVICE DIR DO FREE LIB
LIST LOG SPOOL VERIFY

File handling

APPEND ATTRIB BACKUP
BUILD COMM CONV COPY
CREATE DEBUG PATCH
PURGE REMOVE RENAME
REPAIR TAPE100 DUMP LOAD
MEMORY RUN

Device handling

FILTER LINK MEMDISK
RESET ROUTE SET

simple to see why the Model 4 has been designed as it has. It can use existing software now and new software can take advantage of the larger screen. I'd also expect many existing packages to be adapted to use the larger display.

As it is, the Model 4 boasts the new TRSDOS version 6, TRSDOS 1.3, LDOS and CP/M plus. No doubt that Newdos +, Newdos 80, Dosplus and so on will all make their way onto the machine... even if only in Model III emulation.

Besides the standard TRSDOS utilities, the Model 4 has MEMDISK which allows you to use memory as a fast RAM disk. TAPE 100 will read and write tapes for the relatively revolutionary Model 100. Finally, there's MAILLIST, a crudely written mailing list package in Tandy Basic.

Verdict

To be fair, I expected much more from a new Tandy machine — especially with the obvious success of its portable Model 100. But the Model 4 does fit the philosophy of business orientated hardware that runs all current Model III software.

This is a selling point but the business person looking to replace an old Model III shouldn't fall for this. It's like trading in an old but reliable and trusted car for a new one that's a different colour and has a couple of bells and whistles. But for the prospective first time buyer, the Model 4 is well worth adding to your shortlist.

what Tandy claims to have available then my past efforts would have been much less arduous.

Tandy Basic is a Microsoft commissioned product and is typically rugged. By now, it's a well known and used version of the language. But I didn't like the long delay in loading the interpreter from disk each time I called it from TRSDOS.

But the real advantage of the Model 4 is access to existing software. Compatibility with earlier machines was a must as it would have been self-defeating to preclude the Model 4 from the Model III's huge software base.

It is interesting to note that Tandy is reported in the US press as being the

largest vendor of business software for micros — by a considerable margin. So it's

SPECIFICATION

Price 16K cassette £749, 64K 1 drive £1,299, 64K 2 drives £1,499

Processor Z80 4MHz

RAM 16K (cassette) 64K-128K (disk)

ROM 14K (cassette)

Text screen 80 × 24, 40 × 24, 64 × 16 and 32 × 16

Graphics screen 160 × 72

Keyboard 70 keys, built-in, 3 function keys, numeric keypad

Storage Twin 184K floppies

Interfaces Parallel, Expansion bus, optional RS232

OS/Language TRSDOS level 6, Basic

Distributor Tandy, Tameway Tower, Bridge St, Walsall, West Midlands

Software supplied Demonstration

Computer manufacturers have a problem when deciding which sort of operating system to provide with their products. Unless the company is a giant, with giant resources, like IBM, it finds it very difficult to get applications software writers to write packages for a new machine. It is, if you like, a Catch 22 situation. Software writers are loath to devote time and money to a computer that has yet to show large sales. If they write packages and the computer fails to sell in large enough numbers, they obviously end up out of pocket.

Unfortunately, a computer without any applications packages is not much good to the user and won't sell. In microcomputer parlance this situation could be termed an 'endless loop'.

So the only solution for many small and medium-sized manufacturers is to design their computers to use one of the industry standard operating systems. But an 'industry standard' is created by its being around long enough to accumulate packages written to run under it. So the tendency has been for potentially innovative hardware to be compromised by the need to accommodate an operating system designed for an earlier age.

This scenario particularly applied to CP/M. But it is possible to compromise. Torch Computers was a typical case of a new manufacturer faced with the situation mentioned above. The Torch solution was to develop a CP/M-compatible operating system, the idea being that it would be an improvement on CP/M but still provide Torch users with access to the huge library of CP/M software.

Torch claims its version of CP/M, called CPN, is friendlier — easier to use and understand. As well as being the standard operating system for the Torch, it is available as an upgrade option for the popular BBC. Torch is offering a Z80 processor with 64K RAM on a

CPN BY TORCH

card which fits inside the BBC, plus twin 5.25in drives to go under it, effectively turning the BBC into an economy version of the Torch itself. (Full Pro-Test of the Torch Pack, PCN issue 16).

CPN actually stands for Control Program Nucleus. Unlike CP/M, which is loaded into the system from disk every time the computer is switched on, Torch has stored the CPN operating system in ROM in the machine.

Torch claims the built-in CPN commands are essentially the same as those found in CP/M. But as you would expect, there are a few differences.

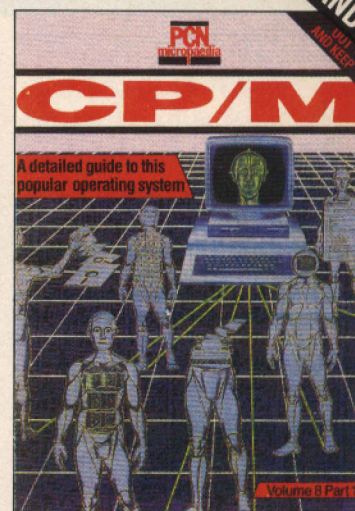
The table below compares some of the commands.

Under CPN you can't just go out and buy or borrow a CP/M program and expect to be able to run it — there is always the thorny problem of disk format compatibility. For most users the range of packages available from Torch Computers should fill most needs. According to Torch there are around 200 packages available from dealers for the Torch and Torch Pack. These include the popular WordStar, Supercalc, and Dbase II.

As an extra bonus Torch is offering a free 'bundle' of applications software with the Torch Pack comprised of Perfectwriter, PerfectCalc, PerfectFile and Perfect-Speller. Torch and CPN seem to have overcome the endless loop syndrome and established CPN among dealers.

Torch says that the rationale behind the release of the Torch Pack was to play the numbers game to the advantage of CPN. The more systems being used, the more dealers are prepared to supply applications software to run under CPN. Sheer volume of software being supplied also has a lowering effect on prices.

As an alternative form of CP/M, CPN must make an attractive offering to users who want a wide range of software options.



VOLUME 8

The table below compares CP/M commands with Torch CPN commands. CPN stands for Control Program Nucleus and allows the user to run CP/M programs on the Torch, although there are snags.



CP/M Command

DIR
ERA
ERAQ (MP/M)
MOVCPM
PIP

REN
SAVE
STAT dev:=dev:
STAT DEV:
STAT filename
STAT filename \$ r/o etc.
STAT d:
STATUSR:
SUBMIT
SYSGEN
TOD (MPM)
TYPE
USER
XSUB
FDISC

Torch CPN Command

DIR CPN Command can be given several filenames and also options.
DELETE Prompts for each filename (like ERAQ).
The [u] option stops prompting.
Not Required.
COPY, DUP, INPUT, or PRINT depending on operation desired.
RENAME Different syntax. Allows multiple renaming.
Identical to CP/M Version 2.2.
No Equivalents at Present.
Some facilities provided by *FX2 and 3.
[L] and [P] Options of PROTECT.
PROTECT.
[S] option of DIR.
Similar To USER Command.
COMMAND (C) Works slightly differently.
Not Required.
TIME.
Same.
Same as CP/M Version 2.2.
Provided automatically by COMMAND.
FORMAT and DUP.



CP/M: SOFTWARE

CODES FOR CONTROL

Control codes are one of the easiest methods of communicating with your micro under CP/M, so to help you with that communication, here is a list of those codes and what they do:

Control C — Restarts CP/M or aborts to the command processor if you're running a program.

Control E — Moves the cursor to the beginning of the next line. Is often used when you want to type in command lines without hitting Return.

Control H — Deletes one character to the left of the cursor.

Control I — Often referred to as TAB — its function is to move the cursor forward eight columns and it can be used in text files.

Control M — Same as Return.

Control P — Turns on the list device. This is usually the printer, but that can be changed using PIP. It's a toggle switch, so to turn it off you have to enter Control P again.

Control R — Displays the previous line as it was left in the buffer.

Control S — Stops the display but doesn't stop processing if a program is running.

Control U or Control X — Cancels the current line and stops it from being sent to CP/M.

Control Z — marks the end of a file.

If you have decided to get a CP/M based system, you'll have to ask some questions about the system. What does CP/M work with, what *will* it work with, how can it make life easier for you and what about expanding to a better system?

There are answers to all these questions, but the solutions themselves may not be that easy to implement. We all know that software running on one CP/M machine should run on another, but — and this is the important question — how do you get the software on your system?

The point is that although CP/M is a 'standard' operating system, there are sometimes slight differences in the way it works on different systems. This is important because transportability is the name of the game.

Micros running CP/M tend to be either 8080 or Z80 based machines. There are three ways in which to get a CP/M-based micro. First there is the manufactured machine, which has an 8080 or Z80 processor as standard. Many of these used to be S100 machines to which you added more memory by slotting in another board.

But the technology has now moved on, and it is possible to obtain a Z80-based machine with 64K memory, disk controller, I/O facilities, keyboard and screen all in one box. These aren't S100, because the memory and processor are now on one board instead of several.

The second type of CP/M machine is the upgrade one. These are micros, like the Pet and Apple, which have expansion capabilities. These two machines have the 6502 microprocessor, and therefore do not qualify as CP/M machines, but various Z80 boards which plug into/onto the Pet or Apple are available. These extra boards are normally Z80 processor boards with some memory (up to 64K) which allow 6502 machines to run CP/M.

The third type of CP/M machine is really constructed

by the hobbyist. Here, the hobbyist first designs the specifications for a CP/M machine, perhaps to consist of a Z80A processor, plus 64K RAM on one board, with I/O, disk controller and RS232. The need for expansion should also be taken into account, so some sort of bus system is often included.

To get the system together, you obtain the different parts from various manufacturers and put them together like a Lego kit, then put a fancy box around it.

With each type of CP/M machine there is one more step to go through before CP/M can be used. The manufacturer of the micro or add-on boards needs to get a licensing agreement from Digital Research to run CP/M on the kit.

There are now hundreds of CP/M machines, but the systems future is more debatable. Some say that the percentage is decreasing due to the current popularity of 16-bit machines. However, CP/M86 operates on 16-bit machines, and is basically (in operation) the same as 8-bit CP/M. And there are too many 8-bit CP/M systems and users around for anyone to try to sweep them under the carpet. Software houses will still be producing CP/M software for some time to come.

The problems of getting CP/M programs written for one machine to run on another are numerous. First, if you wish your programs to be transportable, then they shouldn't include fancy machine-dependent features. If you cannot avoid this, then have the machine-dependent features as a separate module from the main body of the program.

The most common method of configuring a program to run on several machines is to set up a Config file. First there is the main body of the program which is held as one or several files, then you have a small sub-program which can either pass to the main program the parameters for screen handling or store the parameters, which are 'collected' by the main program.



ARE & SYSTEMS

When run, the Config program should ask the user what keys are going to be used as cursor keys, what is the control code for inverse video, what is the code for clear screen and home cursor and so on. When the answers have been collected and stored in the Config program, all is well. When the main program is run, it can read the Config program and use the data in it to do these jobs.

There is no 'standard' for 5¼in drives, and this poses a problem for anyone who wishes to transfer programs to another system. For the owners of 8in systems, things are a little better as the IBM 8in standard format applies, but remember, not all manufacturers follow this. But if you're unfortunate enough to have a system where you cannot simply transfer programs/data by using the same disk, then all is not lost. There are a couple of programs on the market which enable you to transfer programs to another system by using the RS232 port and/or printer port.

Two of these are R-COM4 and T-COM4 or BSTAM.

Both will allow you to transfer files from one machine to another, even over the telephone. Checking is done, and if any data is scrambled then the corrupted block is reread. The advantage to these programs is that they will allow you to transfer programs between different disk formats.

The disadvantage as far as R-COM4 and T-COM4 are concerned is that the sending as well as the receiving systems must have a copy of the transfer programs.

CP/M machines: top left, the Osborne Executive, above, the RML 380Z and below, the RML 480. The range of machines running CP/M is wide because there are only three criteria. Your micro must have (or be able to handle) a Z80-type processor; it must have disks; and it must have a reasonable amount of memory (64K recommended). If you have that, there's nothing to stop you — provided that somebody has an implementation of CP/M for your micro.



FACTS ON FILENAMES

One of the big snags about CP/M is that it only allows you to specify filenames with up to eight characters. This may seem a lot, but it is all too easy to accidentally overwrite a file because you used the same filename. It is best to organise your files into different types, and CP/M does this to an extent by creating backup files with the extension .BAK, or temporary files with the extension .\$\$\$.

You can organise your files much more effectively if you use the 'standard' file extensions:

.ASM Source file of an assembly language program.

.BAK Backup copy of a file, ED uses this.

.BAS Source file of a Basic program.

.COB Source file of a Cobol program.

.COM File containing an executable program or a transient command such as STAT.COM

.DAT Used to denote that the file contains data.

.DOC File of messages or documentation.

.FOR Source file for a Fortran program.

.HEX A hexadecimal file created by using the assembler ASM.

.INT CBasic executable program created from a .BAS file.

.LIB Library of source routines for programs.

.LST File containing a printable listing.

.MAC Source of an assembly language subroutine.

.MSG Similar to .DOC.

.PAS Source file for a Pascal program.

.PRN Printable file created by a text formatter.

.REL Relocatable binary file.

.SAV Systems file.

.SRC Source file from CP/M users group.

.SUB Source file of commands for the SUBMIT program.

.SYM Symbol table generated by a MAC program.

.TXT Used to denote that the file contains text.

You can, to an extent, get a form of batch processing CP/M by using the transient program SUBMIT. Here a list of commands is created in a text file (using ED) and given the extension of .SUB. So, to delete all .BAK files do a STAT and a DIR; enter into the .SUB file:

```
ERA A: *.BAK
STAT A:
DIR
```


CP/M FROM THE INSIDE

CP/M's flexibility, ease of use and software support make it attractive to the average user, but its structure means that it is also popular with system programmers. CP/M's internal structure allows you to write a program on one system and run it on another.

When you invoke CP/M, it is loaded into RAM and occupies two main areas. The first consists of 100 Hex locations (0000 to 00FF). The second is approximately 8K in length, contains CP/M itself, and resides at the upper part of memory.

Diagram 1 shows the memory map of CP/M. The first (or lower) section of memory is used as a systems communication area. Information can be sent here or retrieved from here. The upper part of memory where CP/M resides is divided into three more sections called the CCP (Console Command Processor), the BDOS (Basic Disk Operating System) and the BIOS (Basic Input Output Section).

Between the two areas is the TPA (Transient Program Area), used by the user program and data. Note that any CP/M .COM facilities, such as STAT.COM, use this part of memory as well, thus they are called transient functions.

Functions such as DIR are part of the CCP, and therefore do not take up any user memory. You can see from the memory map that the CCP does not have a fixed address. This is because CP/M is designed to allow for memory expansion.

The address of the CCP is found by looking at the contents of locations 6 and 7, although you don't have to do this as CP/M does it for you. The CCP itself occupies a fixed amount of memory and is 2816 bytes in length.

CP/M itself is made up of a number of programs. These do several jobs, from printing characters to the display device to reading characters from the keyboard. System calls are invoked whenever control is passed to CP/M. Control is passed back to the program when the desired function has been completed.

Each function is called from the systems communication area at the base of memory by placing the desired function number into the C register. A call is then made to function 5 in the systems area, which contains a jump to the BDOS and the necessary function is executed. The following illustrates this:

```
LD E, 'H' put character in register E
LD C, 2 put desired function number in C
CALL 5 CALL CP/M
```

When this code is run a character will be printed to the output console.

Notice how flexible this arrangement is. Take for example a programming language with this arrangement of calling fixed functions. Here if in the language we said PRINT "H", the interpreter would simply call function 2, which would print the character.

The writers of the interpreter wouldn't have to worry

about what the output was (printer, VDU, so on), where it is located in memory and what ports it uses. Instead a simple system call is made and CP/M's BDOS or BIOS does the rest. This is why it is possible to write programs to run on different CP/M systems.

As mentioned earlier, function calls are achieved by making a system call to the CP/M entry point, which is in the reserved area below 100 Hex. The entry point is the 5th location, and it is a jump instruction to the CP/M entry point which is the base of the CCP.

This is because memory may change size when extra RAM is added to the system. CP/M ensures that the address at location 5 is always updated with the correct address.

This is achieved by using a transient program called MOVCPM. Part of MOVCPM changes the address whenever a new memory image is being created for a different size memory. Here we can see that no matter what the memory size, the CP/M entry point will always be location 5, which will be updated whenever RAM is added by using MOVCPM.

As you can see from the example program, the first piece of information that is passed to CP/M is the call number of the program which you would like CP/M to execute. The call number is placed into the C register prior to the call to CP/M. The call number is read and the necessary program or routine executed.

But it will be necessary to pass information to the system as well as the call number. In our example you can see that we have to pass the character to be printed to the console device ('H'). To pass parameters (as they are known), eight bit values such as characters and small numbers are placed in the E register. For 16 bit values such as addresses the DE register pair is used. Values returned from CP/M are placed in either the accumulator (A), or the register pair HL (High Low).

There are several different types of system calls. The first type are the basic input/output system calls (to the BIOS), while the second are the disk input/output system calls (to the BDOS).

The BIOS deals with all input and output of the four logical devices which are supported by CP/M. The devices are as follows:

CON Console display and keyboard for both input and output. Note: this is the only logical device supported by CP/M which is an input *and* output device.

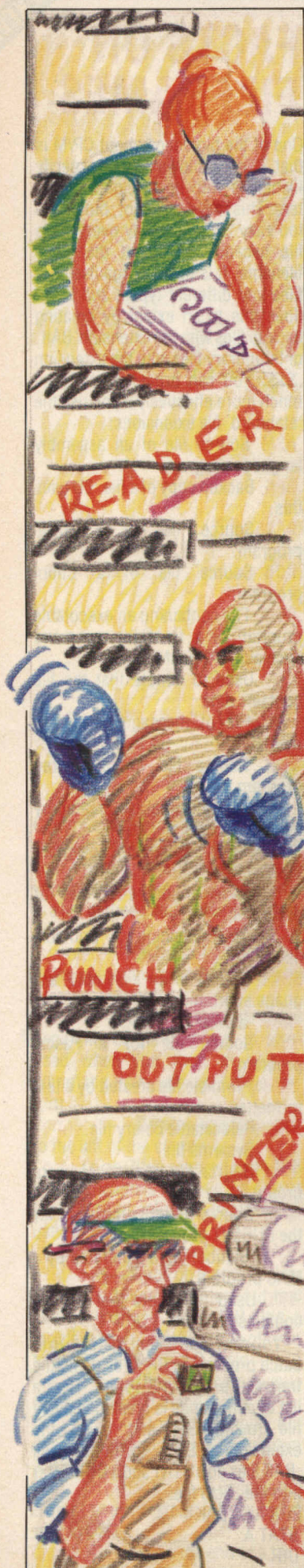
RDR: Reader (paper tape) for data input only.

PUN: Punch for data output only.

LST: List device (usually a printer) for output only.

The second type (the BDOS), deals with input/output to and from the disk file structure.

As well as the I/O functions described, CP/M supports the input and output of character strings. This is achieved through the console device (CON:). This is supported because it's easier to make one system call for a whole line of characters than a call for each character. The string type call is referred to as



buffered I/O, and to get the string of characters displayed on the console device a buffer must be set up in memory.

CP/M detects the end of the buffer by the '\$' sign terminating it. The address of the string is placed in the DE register pair and the call number is placed in the C register. The structure of the print buffer looks like this:

c1 c2 c3 c4 c5 c6 cK \$

K is the number of characters and the '\$' signifies the end of buffer marker. The input buffer is of a similar structure, although there is a difference. It looks like this:

m k c1 c2 c3 c4 . . . cK

M is the maximum amount of numbers allowed in the buffer, K is the number of characters actually in the buffer. The buffer is filled until a carriage return has been detected or until the maximum number of characters has been reached.

If you are going to use CP/M for machine code programming, you may not want to bother with buffering when it comes to accessing the console. CP/M allows you to access the console directly without the need to set up buffers. The two system calls which allow you to do this are 11 (get console status) and 6 (direct console I/O). The first allows you to find out if the keyboard has been struck, and the second allows direct I/O to and from the console.

With every version of CP/M, some extra or modified function call seems to be added or amended. Version 2.0 of CP/M has some extra system calls which were not supported in version 1.4. One of them is call number 12, get version number which would be returned in register L. The number is held as a hexadecimal value and starts off with 20 Hex for version 2.0. So for 2.2 the number will be 22 Hex.

This call may not sound as if it has any use, but think again. If you have a program which will operate under version 2.2 of CP/M, then all that need be done is to interrogate function 12 to see if the value 22 Hex is returned. If not, then all is not well. The other function call is 0. All this does is a system reset (warm boot), and it can be called from within a program whenever you wish to pass control over to the CCP.

And there are a good number of reasons for bothering to find out more about the BDOS, as it operates with the essential peripheral in CP/M — the disk drives. What happens, for example, when you give the prompt A: to access Drive A in CP/M?

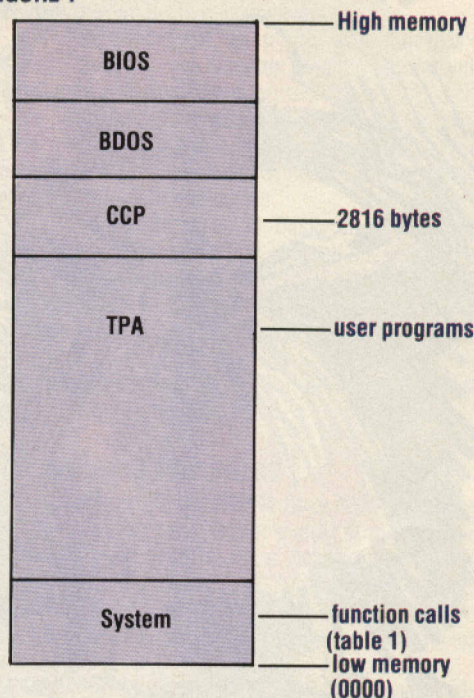
First, the Console Command Processor will interpret this and 'call' the necessary function in the system area (function 14). The system area would then communicate with the BDOS. Each file on the disk must be included in the DIR or directory, which sits on the centre track of the disk.

This is where the second part comes in, loading the directory into memory. The task is accomplished using a File Control Block containing the following information: the Drive Code, the File Name, the Extent, the Record count in current extent, the disk allocation map, information on the next record number to Read/Write and a Random Access area used for random access file maintained by CP/M.

Records can overlap — and may be split into two or three disk tracks, depending on their size. The BDOS of CP/M works out where the file and individual records are to be kept on disk.

For a full explanation of the BDOS, refer to the PCN Disk Drives Micropaedia Part II, page 92. For additional information on CP/M, contact the CP/M users group.

FIGURE 1



The memory allocation for CP/M begins at the low end with room for systems communication and an area for CP/M itself (not seen in this diagram). The TPA, or Transient Program Area, allows for programs and data — and it's followed by three additional areas: the CCP (of which we've already spoken), the BIOS and the BDOS. To boot CP/M, information is passed between BIOS and BDOS.

FUNCTION CALLS AVAILABLE IN CP/M (VERSION 2.2)

FUNCT	NAME	INPUT	OUTPUT
0	System reset	none	none
1	Console input	none	A=char
2	Console output	E=char	none
3	Reader input	none	A=char
4	Punch output	E=char	none
5	List output	E=char	none
6	Direct console I/O	Ref CP/M 2.2 guide	
7	Get I/O byte	none	A=0003
8	Set I/O byte	E=iobyte	none
9	Print string buffer	DE=string	none
10	Read console buffer	DE=buffer	string
11	Get console status	none	A=status
12	Get version number	none	HL=version
13	Reset disk system	none	none
14	Select disk	E=disk	none
15	Open file	DE=fcb	A=dir code
16	Close file	DE=fcb	A=dir code
17	Search for occurrence	DE=fcb	A=dir code
18	Search for next occurrence	none	A=dir code
19	Delete file	DE=fcb	A=dir code
20	Read sequential	DE=fcb	A=error code
21	Write sequential	DE=fcb	A=error code
22	Create new file	DE=fcb	A=dir code
23	Rename file	DE=fcb	A=dir code
24	Return login vector	none	HL=login vector
25	Return current disk	none	A=disk No
26	Set DMA address	DE=DMA	none
27	Get RBR address	none	HL=RBR
28	Write protect disk	none	Ref CP/M 2.2 guide
29	Get R/O vector	none	HL=R/O vector
30	Set file attributes	DE=fcb	Ref CP/M 2.2 guide
31	Get DPB address	none	HL=DPB
32	Set or get user code	REF CP/M 2.2 user guide	
33	Read random	DE=fcb	A=error code
34	Write random	DE=fcb	A=error code
35	Compute file size	DE=fcb	Ref CP/M 2.2 guide
36	Set random record	DE=fcb	guide
37	Reset drive	DE=drive vector	A=0
38/39	No operation		
40	Write random record with zero	DE=fcb	A=error code

TAKE YOUR CHOICE

There may be a time when you decide to upgrade to a 16-bit system. Here you have a choice, and the two main contenders seem to be CP/M-86 and MSDOS. Each of the operating systems has its pros and cons, and it is up to you to weigh them up before making the plunge.

CP/M-86, like CP/M, keeps information about files on the disk, and the buffers of data are quite small. This means that read/writes tend to be slow. The speed of read/writes will vary greatly due to the fact that different manufacturers amend the BIOS for their own system. The worst feature (or lack of it) of CP/M-86 is the error recovery. The system will hang up if there is no disk in the drive and a read has been attempted. There is nothing to stop the manufacturer including some error trapping, although not many seem to be doing this.

On the plus side are the large help files available to CP/M-86 users. Also, the user guides are quite good.

If you wish to reconfigure the system, CP/M-86 allows you to do so quite easily with STAT.

The file management for MSDOS is quite fast, which means that disk input/output is very fast. The reason for this is because the information on file locations is held in memory rather than on the disk.

MSDOS shines as far as error recovery is concerned. Error recovery is part and parcel of the operating system, and the error messages on MSDOS are in a readable form.

Reconfiguring an MSDOS system can be a bit tricky. If you buy a new peripheral and want MSDOS to take notice of it, then some nifty fiddling with the operating system needs to be done.

You'll usually find some sort of configuration program with most MSDOS programs.

For example, in the CP/M Perfect Software suite of word-processing, spell checking, database and spreadsheet packages there is an extensive configuration program that you must run before doing anything else with the package. The program tests to make sure it correctly recognises all the attributes of the computer it's running on and then goes on to ask you about the peripherals you'll be running with the package.



THE BATTLE OF THE GIANTS

Computer technology has changed a great deal since CP/M first arrived, with major advances in CPU speed, RAM size, peripheral development and so on.

Luckily, CP/M is flexible enough to have coped with most of these developments. CPU speed changes or memory additions are no problem; a few boundaries are changed within CP/M, and the system will run.

The latest change is the appearance of 16-bit systems in large quantities. Alas, CP/M cannot be transferred to the new machines, so it has to be rewritten to run on the new systems.

One of the new manifestations is CP/M-86, written to run on Intel's 16-bit 8086 microprocessor. Digital Research, which developed CP/M, hasn't got the market to itself any more and there is competition to provide operating systems for the 16-bit family. One of them is Microsoft's MSDOS, considered by many to be the biggest threat to Digital Research's CP/M-86.

Fortunately for the user, many of the new 16-bit micros can run both MSDOS and CP/M-86. It is worth comparing the two systems to see what they do and how they do it.

CP/M-86

For those who have an 8-bit system and wish to expand to a 16-bit system, CP/M-86 offers the easier of the two means of upgrading. You are probably using 8-bit CP/M, and the commands on CP/M-86 are very similar.

You will not however, be able to run source code from your 8-bit system onto CP/M-86. To do this you will need a translator.

If you're lucky the source code (in Basic, for example) might run on CP/M-86 Basic, then you could transfer the source code to the 16-bit machine by using some kind of file transfer program. To do this you would need to set up a link between the two machines, probably through the RS232 port.

Once CP/M-86 is up and running, you will be confronted with the familiar 'A>' prompt. As you would guess, the default drive for CP/M-86 is A.

Inexperienced users would also be interested to know that you can invoke CP/M-86 on many systems by merely placing the systems disk in the machine and applying power. Some machines will ask you whether you wish to use MSDOS or CP/M-86, but the smarter ones will invoke one of the operating systems automatically.

CP/M-86 comes with a number of useful utilities, which include the text editor (ED), an 8086/8088 assembler (ASM-86), and a dynamic debugging tool (DDT). No doubt as time goes on, many other utilities will be released by the manufacturers and software houses.

Not all of these tools need cost you money — some are 'public domain' software and can be obtained from user groups or clubs.

The components of CP/M-86 are also similar to 8-bit CP/M. There is the Basic Input/Output system (BIOS),

the Basic Disk Operating System (BDOS), the Console Command Processor (CCP) and the Transient Program Area (TPA). The functions of these areas of CP/M-86 are as follows:—

- BIOS — This area communicates with disk drives and other devices. This area is invisible to the user.
- BDOS — This controls the disk drives and also performs file maintenance.
- CCP — This reads the keyboard and processes commands. When you enter a command it is the CCP that interprets it and takes the necessary action.
- TPA — Your programs and data occupy this area, which can be changed to allow for memory expansion.

Of course, you will be looking for programs to run on CP/M-86 and there seem to be a few. Microsoft has not supported Digital Research's CP/M-86, even though many other manufacturers have released languages for CP/M-86. You can also get C, LISP and APL for CP/M-86.

MSDOS

This is the operating system from Microsoft. Although different in many ways, MSDOS and CP/M-86 perform the same function to act as an operating system.

Most of Microsoft's system languages are available to run on MSDOS. But it functions differently from 8-bit CP/M, so you'll have to learn a new set of commands if you are upgrading to it.

MSDOS is made up from three files: **COMMAND.COM**, **MSDOS.SYS** and **IO.SYS**. If you look at the directory of the systems disk, you will notice that both **MSDOS.SYS** and **IO.SYS** are not displayed, as they are hidden files.

There are four different disk areas with MSDOS. There are reserved areas (sectors) on the disk that contain information used each time MSDOS is loaded. The directory contains information on all files and will include information on the file specifier, size and time and date of last modification. The File Allocation Table (FAT) contains information on the data which makes up a file. Finally, there are the files themselves which don't necessarily have to occupy sequential disk space; they may be scattered.

The major difference between MSDOS and CP/M-86 is the way MSDOS treats files and devices. MSDOS supports device-independent I/O, and this means that the distinction between files and devices is internal.

The similarity between CP/M continues when we learn that MSDOS has internal and external commands. Here is a list of the internal commands available on MSDOS:—

- COPY** Copies specified files or file.
- DATE** Sets and displays date.
- DEL** Deletes specified files or file.
- DIR** Lists directory (may be specified).
- PAUSE** Pauses for input in a batch file.
- REN** Renames a file.
- REM** Displays a comment in a batch file.
- TIME** Sets and displays time.
- TYPE** Displays the contents of a specified file.

There are also a number of external commands with MS-DOS:—

- CHKDSK.COM** Checks specified disk and gives status information.
- FORMAT.COM** Prepares a new disk for storing data.
- DCOPY** Disk to disk copy program.
- RDCPM** CP/M-86 file transfer program.

PCDOS

Similar to MSDOS is PCDOS, the operating system

developed for the IBM PC. There are subtle differences between the two systems, however.

The first difference has to do with the IBM's interrupt-driven screen handling, and the second with the PC's system of program protection.

The interrupt problem is based around the fact that VDUs on most micros behave like the teletype machines that preceded them while cursor addressing is handled by ASCII characters.

Due to the differences in Basic under the two operating systems, you'll find yourself missing some MSDOS commands if you move to PCDOS — such as the **WIDTH** statement. Although extensions to the Basic are now becoming available, it may take some time before you can get them.

For more details on PCDOS and MSDOS conversions see *PCN Issue 6, Page 18*.

The systems compared

For the user, the choice of CP/M-86 or MSDOS may be irrelevant, but for the operator and/or programmer it can mean a lot. The operator needs an operating system that is easy to use, robust, flexible and understandable. The programmer needs a system with which he can manage files easily and program for error-trapping.

CP/M, CP/M-86 and MSDOS have separate functions which are called by the programming language or program directly. It's important for the programmer to know what the functions are. Here is a list of those functions:—

FUNCTION	DESCRIPTION
0	System reset for CP/M-86 and MS-DOS.
1	Console input with echo, for CP/M-86 and MS-DOS.
2	Console output; same as 1.
3	Reader input for CP/M-86, same for MS-DOS but only one auxiliary input device.
4	Punched output; same as 3.
5	List output; same as 3.
6	Direct console I/O for CP/M-86 and MS-DOS.
7	For CP/M-86 get IOBYTE. For MS-DOS direct console input with echo.
8	For CP/M-86 set IOBYTE. For MS-DOS console input with echo.
9	Print string for CP/M-86 and MS-DOS.
10	Read console buffer for CP/M-86, almost the same for MS-DOS.
11	Get console status for both systems.
12	Return version number for CP/M-86. For MS-DOS clear keyboard buffer.
13	Reset disk system. Same for CP/M-86 and MS-DOS.
14	Select disk. Same for both systems.
15	Open file. Same for CP/M-86 and MS-DOS.
16	Close file. Same for CP/M-86 and MS-DOS.
17	Search for first. Same for CP/M-86 and MS-DOS.
18	Search for next. Same comments for 17.
19	Delete file. Same for both systems.
20	Read sequential. Same for both systems.
21	Write sequential. Same for both systems.
22	Make file. Same for both systems.
23	Rename file. Same for both systems.
24	Return log in vector for CP/M-86, not used by MS-DOS.
25	Return current disk. Same for both systems.
26	Set DMA address. Same for both systems.
27	Get address of allocation vector. Same for both systems.
28	Write protect disk. Used by CP/M-86 but not MS-DOS.
29	Get read-only vector. Used by CP/M-86 but not MS-DOS.
30	Set file attributes. Used by CP/M-86 but not MS-DOS.
31	Get address of disk parameters. Used by CP/M-86 but not MS-DOS.
32	Set/get user codes. Used by CP/M-86 but not MS-DOS.
33	Read random. Used by both systems but note different failure codes for both.
34	Write random. Same as 33.
35	Compute file size in records. Same for both systems.
36	Set random record. Same comment as 35.

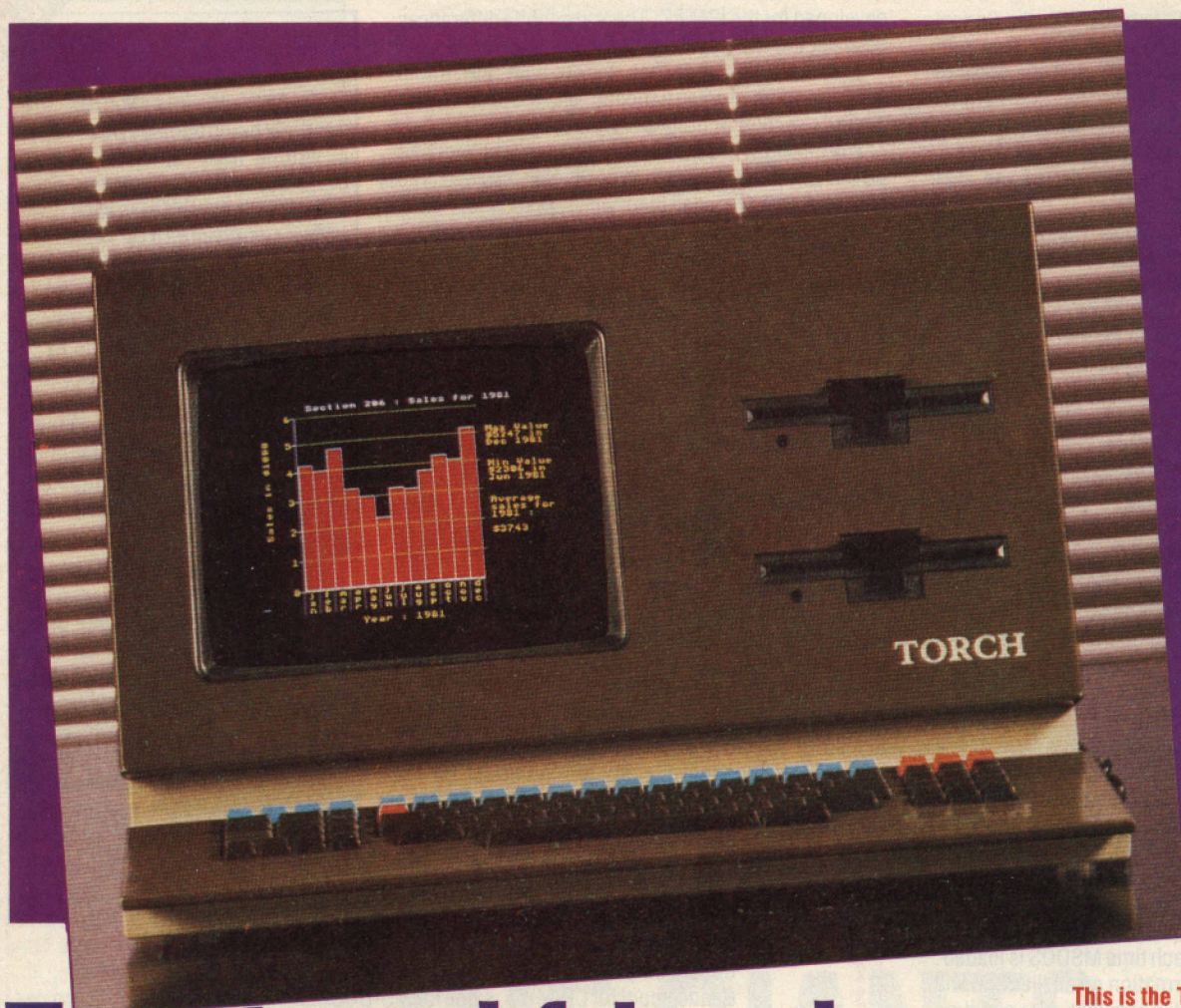
Note that although a given function may carry out the same task it will often carry out that task differently on different systems.

Future stock

Both CP/M-86 and MSDOS are currently being updated. At the time of writing (July 1983) Concurrent CP/M-86 is still to be launched. This will enable several tasks to be done at the same time. You could, for example, be editing one letter while printing another.

It is also promised that future versions of CP/M-86 may run up to three times faster as a result of the transformation of the index keys by a method known as 'hashing'. There may also be some additional error trapping as CP/M-86 is somewhat lacking in this respect at the moment.

MSDOS version 2.0 is to have a new user interface with windows of information presented to the user. Online help files will also be available by entering '?'. Another important development will be that MSDOS will support a protocol for text and graphics. Networking an enhanced **DEBUG** and serial printer support is also on the horizon.



Front end friend

Although CP/M may seem a perfectly sensible operating system to people who've used it for a while, to beginners it's often baffling.

To remove much of that bafflement, software houses have designed 'front end' programs which turn operating system commands into simple English. They often run as 'background programs' which must be loaded before running any CP/M programs.

For example, the Torch Mail Plus running on the Torch CPN CP/M lookalike system can be used as a front end for running all kinds of programs including word-processors, games and spreadsheets.

On booting up the machine, you immediately load the front-end program into the machine. A typical front-end will then offer you a series of menus, giving you single-key entry choices about program-loading, file-handling, disk formatting and device control.

On the Torch Mail Plus front end, you have a series of choices once the front end has been loaded. The first two choices let you use the machine's built-in modem to call another machine. The third choice lets you use the machine's internal clock to create an alarm call that beeps intermittently when it goes off.

The fourth choice is a summary that tells you what programs you've run and what calls you've made using Torch Mail.

This function is a good example of the background nature of front ends. The front end does all the house-keeping items like keeping track of the time, calling up programs and keeping a record of which programs have been called.

Torch's program also controls local file operations, deals with file and drive protection and keeps a list of telephone numbers and passwords.

To enter a program such as Wordstar from the front end Mail Plus program, you just choose Option 6 — Timed Command Execution and then type 'WS' for Word Star, and Mail Plus will load the Word Star program.

When you're finished you press the Word Star QUIT command. Mail Plus automatically reloads and presents you with the Mail Plus menu again.

In this case, the front-end menu also carries out the business of making phone calls, connecting to a networking system and taking care of the necessary access code and Obey files to carry those operations out.

Other house-keeping tasks such as formatting, copying, printing, typing and renaming are also the responsibility of the front-end programs. In many front-end menus, you merely press an option such as '(a) Format the disk' or '(b) Backup the files in Drive A to Drive B' and the front-end program will give CP/M the appropriate instructions to carry out that task.

The theory behind the front-end is that many CP/M users, because they are often in business, don't necessarily have a great background in computing. To solve this difficulty, English language front-ends are seen as the solution.

So the average business user needn't know what COPY, FORMAT or PIPS mean in order to use those commands.

This is the Torch computer, which runs a CP/M lookalike operating system called CPN, as well as an extensive front-end program known as Torch Mail Plus.

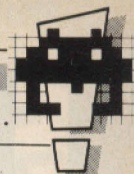
**Contributors: David Janda, Ian Scales and Geof Wheelwright
Design: Nigel Wingrove
Illustrators: David Fathers (Part 1) and Sophie Grillet (Part 2)**

NEXT WEEK

We begin a three part series about the Commodore 64. The Vic-20's new big brother has recently taken a price plunge that will no doubt inspire the interests of many past, present and potential Commodore users.

We'll look inside the 64, how to improve on the machine's Basic, the vast array of serious business applications that can be considered for it, and the games it can play. We'll also give you a rundown on peripherals for the 64 and a discussion of its compatibility with the Vic.

What's your game? Whether galactic warfare or dicing with dragons, PCN keeps you in touch.



CARD GAMES

SPECTRUM

Bridge that gap

Name Bridge Master **System** ZX Spectrum, 16K or 48K **Price** £24.95 **Publisher** Bridgemaster, PO Box 163, Slough, SL2 3YY **Format** Cassette **Language** Basic **Other versions** ZX81 (versions for other computers will be available soon) **Outlets** Mail order

Bridge is a very popular game, but there is a lot to learn before you can start to play, and even more to learn after you have started playing. To learn bridge properly you need good teaching and opportunities for regular practice, and these can be difficult to find.

Bridge Master has been designed for the complete beginner, and uses the Spectrum to help with the teaching and to give you playing practice.

First impressions

Bridge Master comes in a sturdy box which contains two computer tapes, two commentary tapes, an instruction booklet, and a Penguin paperback, *Begin Bridge With Reese* by Terence Reese.

The instruction booklet explains how to load the computer tapes and use the commentary, and gives information about using the program.

Full instructions and all of the bridge teaching are on the commentary tapes. The commentary is spoken clearly and at an even speed.

The Terence Reese book is not used directly in the Bridge Master teaching, but is included for reference and supplementary reading.

In play

The commentary begins right at the beginning, explaining the mechanics of playing bridge, and then takes you on to the first practice deal on the computer tape. On the first deal the commentary explains how to use the program and takes you through the play of the cards step by step, illustrating the basic information on how to play bridge that was given in the first section of the commentary.

The computer tapes contain between them 55 bridge deals which you use to practise playing bridge. On most of the hands the commentary gives you an introduction and some hints, and you are then expected to play the hand for yourself before continuing with the commentary, which goes on to explain the play of the hand in detail with emphasis on the new ideas introduced in the hand. There is an 'autoplay' option where the computer plays through the hand for you and you are expected to use this when following the explanatory part of the commentary.

The program will only allow you to play each hand in one way and gives a beep if you try to play any card except the one it is programmed to accept. Often, there are several cards you could play without affecting the outcome of the hand, so when you get a beep you have to stop and think about whether you



have actually made a mistake.

However, this is a minor point and does not really affect the use of Bridge Master. It would probably be impractical to include the amount of data that would be needed to handle even minor variations in the play.

Bridge Master introduces the various features of the game in easy stages, beginning with playing the hand and taking tricks, then moving on to contracts and bidding, and later introducing the scoring.

This is just the mechanics of the game, and most of the teaching is devoted to helping you to reach a good standard of play. Bridge Master concentrates on the important fundamentals, such as planning the play in order to make your contract, and keeping track of the cards that have been played. All of the basic strategies in the play of the cards are covered, and the 55 deals give you plenty of practice in the most important plays.

The bidding is based on the widely used Acol system, but Acol, or any other bidding system, contains much more than can be covered in any introductory course. Bridge Master deals with the most important and most commonly used parts of the Acol system, which is fairly easy to learn as at this level it is almost entirely 'natural' bidding. The only completely artificial bidding

mentioned is the widely used Blackwood convention.

The program is very reliable and will stand up to any errors. The main menu, which you use to select the deal and playing option you want, will ignore anything except a valid choice, and as mentioned before the program gives a warning beep during the play of the cards if you type in anything except the card that is expected.

Verdict

Bridge Master is an excellent introduction to bridge, and makes very good use of the computer in its teaching. If you follow the course faithfully you should soon reach a level where you can play with friends without disgracing yourself.

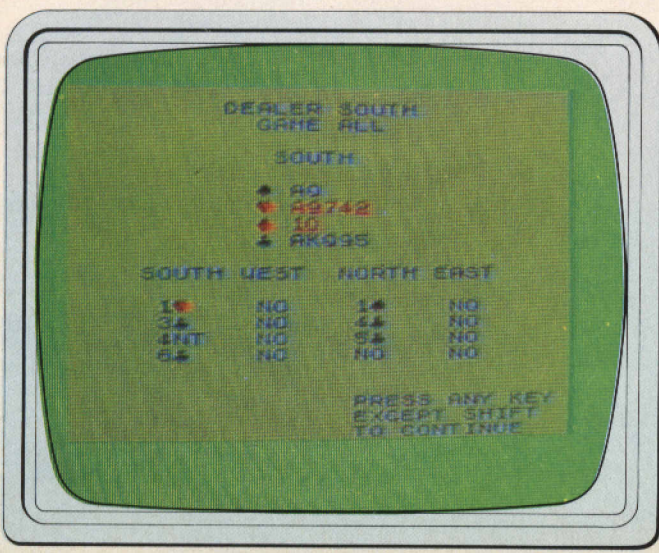
All the fundamentals are dealt with thoroughly and many of the less elementary features of the game are introduced.

The weakest part of Bridge Master is its treatment of defensive play. In all the practice deals you play the declarer's hand and although you learn something about defence from the explanation of the play in the commentary, you do not get any practice defending a hand.

Ted Ball

RATING

Lasting appeal
Playability
Use of machine
Value for money



CAVERNS CLUB

SPECTRUM

Styx and bones

Name Styx **System** 16/48K
Spectrum Price £5.95 **Publisher** Bug-Byte, Mulberry House, Canning Place, Liverpool 051 709 7071 **Format** Cassette **Language** Machine code **Other versions** None **Outlets** High street dealers

This game is based on that cheerful belief that on dying you must cross the River Styx to reach Hades. But first you must negotiate a maze full of spiders before plunging into the river, swimming across, and finally facing an encounter with the Grim Reaper himself.

To help you in all this you have a laser gun, which is conveniently waterproof but only has a limited amount of ammunition. This is fired using any key on the bottom row, with Q, A, O and P controlling the little man.

Styx is a game for one player, and the fact that you're provided with three lives does seem to be rather cheating under the circumstances.

In play

Although Styx is in three phases, they all lead into one another. The top third of the screen is the maze, which has an exit leading down into the river that flows across the middle, and this in turn has an exit into the underworld at the bottom.

The maze is filled with spiders which emanate from a mother-spider who sits in the

top right-hand corner. They're not intelligent enough to come after you, but they do get in the way. Shooting the mother spider seems rather cruel to me, but doing so will recharge your laser (don't ask me how).

It took only about half a dozen attempts to master this section and get to the river below.

You have to swim the length of this to get to the beaching point. The piranha fish are harder to get past as they move up and down as well, and you also have to avoid getting caught in the weeds at the bottom of the river.

Why anyone should go to so much trouble to meet the man in the black hood I don't know.

The final part of the journey provides no challenge, as long as there are bullets in your gun, because there's a recess where you can hide until the four Spirits of the Dead pass in front of you. Then it's across to the man in black, and provided you can avoid his outstretched hand you can then send him off to meet his own maker, whoever that might be.

Verdict

Although the idea and the graphics are quite good, and the responses are quick, the game itself doesn't really come off. While getting through the entire sequence is by no means easy, once you've done it a few times there's nothing much left.

Mike Gerrard

RATING

Lasting appeal

Playability

Use of machine

Overall value



SPECTRUM

Of pits and penguins

Name Manic Miner **System** 48K
Spectrum Price £5.95 **Publisher** Bug-Byte, Mulberry House, Canning Place, Liverpool 051-709 7071 **Format** Cassette **Language** Machine code **Other versions** None **Outlets** High street dealers

If you've ever had the uncontrollable urge to jump over a penguin while it's humming *Hall of the Mountain King* then this is definitely the game for you.

Objectives

The idea is to manoeuvre Miner Willy through the various caverns of a long-forgotten mine-shaft near Surbiton, collecting all the keys in each cave before being able to move on to the next, and eventually up to the surface and untold riches. It's a game for one player with keyboard control, or joystick.

In play

The game opens with simply the best title screen I've ever seen, with the waving palm trees of sultry Surbiton behind a piano keyboard whose keys are moving up and down to the tune, more or less, of *The Skater's Waltz*.

Pressing ENTER starts the game, but if you don't you're given a chance to see the assorted caverns you'll be travelling through, and if you're anything like me this is the only way you'll get to see them.

The first in the proper game is the Central Cavern, and while

every one is different, the general idea is that Willy goes walkabout, jumping over obstacles and slowly climbing up the platforms that lead to the top of the screen, grabbing the keys he needs as he goes. When the last key is taken, the portal leading into the next cave will start flashing and Willy must make his way back to that.

The game requires a lot of thought, practice and timing to get through each screen, especially as they are all being patrolled by robots, ducks and a dozen other creatures — which is where an ability to leap over a penguin comes in handy.

Complications also arise with the platforms, some of which crumble under you as you pass, meaning that you only get one chance to jump from them to the next level. Others are conveyor belts, and once on those you can't change direction, so you have to know well in advance exactly where you're going to jump next. Coming down is even more hazardous than going up.

The graphics and sound are both superb, and if the constant playing of *Hall of the Mountain King* starts to annoy you the writer has thoughtfully provided an on-off switch in the program.

Verdict

Manic Miner is original and amusing as well as hard to master, and I haven't enjoyed a game so much since I first encountered Donkey Kong.

Mike Gerrard

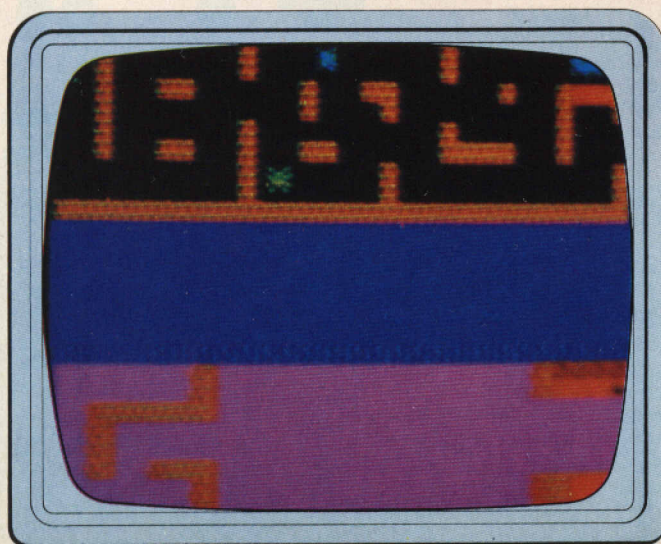
RATING

Lasting appeal

Playability

Use of machine

Overall value



John Lettice and Shirley Fawcett take the line of most resistance. Here's their front-line report.

Atari on the attack

Day by day the quest for original games concepts becomes more and more fraught, and as new titles are released, the problems for gibbering programmers ('Hey Mel, you dribbled on my disk') can only get worse. The Atari is probably one of the machines that is furthest down the road in these terms so, for those of you who pine for the rattle of gunfire and the throb of alien invasions, we present a review of how the software houses are coping.

WALLI WAR



This one is living proof that Atari games are often much happier playing themselves than boring old human beings. Two extremely classy-looking Microbots slog it out with 'Balls of Death' on either side of a wall of moving lights. Once the lights are knocked out, the objective is to attack the Microbot on the other side by disabling its plasma field, which consists of more moving lights.

The instructions explain the scenario in glowing Atari-speak: 'You have been accidentally compuported into a glittering world where life, especially for humans, depends on plasma fields — the stuff of life. It is inhabited by fighting Microbots who spar constantly until aggressive humans take them over.'

Got it? So when you run the game the Microbots are already at it, and you take over by pressing START or SELECT. When you do take over you find it isn't the most skilful of games, and knocking out the light before you get to the main business can be fairly tedious, but it's almost worth having the game just to watch the computer play itself. The graphics really are stunning.

XENON RAID



Well, there I was, protecting the Earth's most advanced military equipment from destruction by the infamous galactic pirates, the Xenons — scout for a convoy

driving through Death Valley, it looks like — when I noticed something really strange. I was obviously moving along the road, as the white line was going backwards, but the cacti on either side seemed to be following me...

But on reflection I decided leaving the cacti stationary and moving the road was just a programming shortcut. They certainly don't show any sign of leaping on you and spining you to death.

Graphics aside, which are good, *pace* the peripatetic pricklers, this is a well-implemented version of 'aliens dive out of the sun, you shoot them, you refuel, then more aliens dive out of the sun'... Good bang-a-microsecond stuff.

REAR GUARD



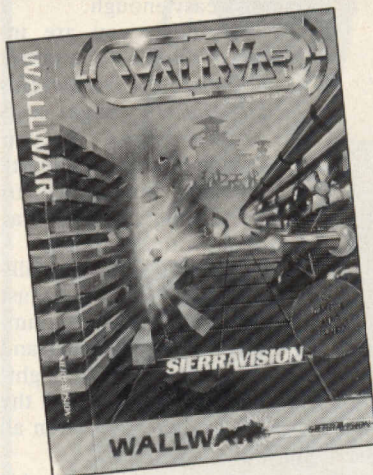
Which is more than you say for Rear Guard. It took me a few minutes to find out how to get out of the attached commercial for the Stone of Sisyphus adventure game, and I'm still not sure how I got into it in the first place. Once you get going, it turns out to be a fairly standard implementation of Defender, where you must shoot down alien attackers who are overtaking you (why am I running away from them?) in order to protect your mothership.

Besides shooting the blighters down — a selection of arrows, SS Enterprise clones and the like — you can also bang into them, but as this drains your shields, it isn't to be recommended.

CENTIPEDE



There are advantages to playing a game before reading the instruction leaflet. There I was under the impression that I was trying to kill a conga line in a graveyard while being attacked by a malevolent wig, only to discover later that you're actually attacking a centipede (the title is a dead giveaway) in a mushroom patch while a giant



spider jumps at you.

All inhuman life is here. The centipede marches down the screen banging into mushrooms — don't be too hard on it, it must be like trying to turn a supertanker — the jumping spider can make mushrooms disappear, the poisonous scorpion poisons mushrooms which then, if the centipede bumps into it, makes the beast go crazy and run straight at you. To cap this, the frenzied flea creates mushrooms whenever he lands.

You, by the way, are a blaster, and you tackle the local predators with what appears to be considerably heavier weaponry than your average aerosol. Atari fans, of course, won't settle, for anything less than heavy weaponry.

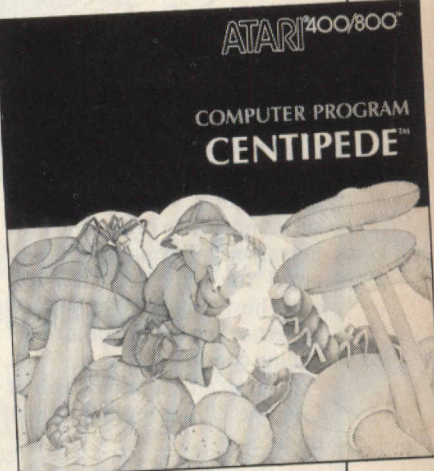
MARAUDER



This one features two games for the price of... well, at current disk software prices, the price of two. Still, each one is a respectable version of familiar arcade favourites, good enough to keep you trigger-happy into the wee small hours.

Game One is a Bomber/Blitz/Mindlessly Violent Game of your choice, where you pilot a bomber at the top of the screen, flattening the planet below you so you can land in the ruins. You get shot at by lasers and torpedoes and indestructible fireballs, and there's also a force field to wreck before you can land.

Don't bother with landing, though — the explosion sequ-



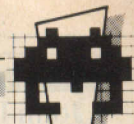
ences when you fail to do so is far better value. Worth losing quite a few lives for.

Game Two is a Berzerk look-alike, in which you have to race around the maze of an alien city, heavily guarded by robots taking pot-shots at you.

Your aim is to find the power source hidden somewhere in the maze and — what else? — blow it to smithereens. Before you can do so, you'll need to dispose of umpteen robots — but you can only spot them when they are in your direct line of vision. Since they tend to lurk in doorways, that can be tricky.

Both games feature plenty of skill levels, to cater for even the most ham-fisted as well as the shooting superstars.

Centipede £29.99 — English Software, 50 Newton Street, Manchester M1 2EA, 061-236 7259; **Xenon Raid**, £14.95 — Adventure International, Box 3435, Longwood, FL 32750, USA; **Rear Guard** £17.95 — Sierra On-Line, 36575 Mudge Ranch Road, Coarsegold, CA 93614; **Marauder** £22 — Sierra On-Line, available from SBD Software, 01-870 9275.



MANAGEMENT ROLES

ORIC

A sticky situation

Name Candy Floss/Handman
System Oric, 48K **Price** £7.50
Publisher IJK Software, 9 King St, Blackpool, Lancs, (0253) 21555
Format Cassette **Language** Basic
Other versions BBC **Outlets** Mail order, various dealers.

Oh, I do like to be beside the seaside... Pardon me, but the combination of a hot summer and a game called Candyfloss is more than a mortal journalist can bear.

Objectives

This is fairly serious business training, as you, proprietor of a Blackpool candyfloss stall, decide how many candyflosses to manufacture, using sugar at such-and-such a price, and how much you will charge for them, given the expected weather, and how much you should advertise, given any other prevailing conditions.

In short, it's a microcosm of Life, the Universe, and Everything.

In play

Candyfloss comes on a cassette together with a pretty slick version of Hangman, rolling-eyed victim and all, which will let you add your own category of words to its Birds, Football Teams, Animals and so forth. Unfortunately, there's no hint in the loading instructions as to how you are supposed to load Hangman.

Still, assuming it's Candyfloss you want to play — and it is the clear star on this cassette — loading's easy enough.

'It is sunny', you are informed, to the tune of a rather off-beat version of *The Sun Has Got His Hat On*. 'Sugar costs .02p per candyfloss'. So you must decide how many adverts to buy, and how much to charge, bearing in mind that you set out with a mere £2.

I planned everything really carefully, set my price just right, made just the right number, advertised just enough and not too much — or so I thought. But, 'Oh dear!' chortled the Oric. 'Donkeys have eaten all Shirley's candyfloss'.

Donkeys apart, though this game is a good way of experimenting with the law of diminishing returns by testing out different strategies on apparently similar days. As long as you don't get wildly carried away, you'll make a small profit most days.

Verdict

A fun educational game, for adults almost as much as for younger players, but one that won't get played more than a few times, since the hazards come at you in the same order each time. Knowing that donkeys are about to attack your stockpile of flosses does reduce the element of surprise.

Shirley Fawcett

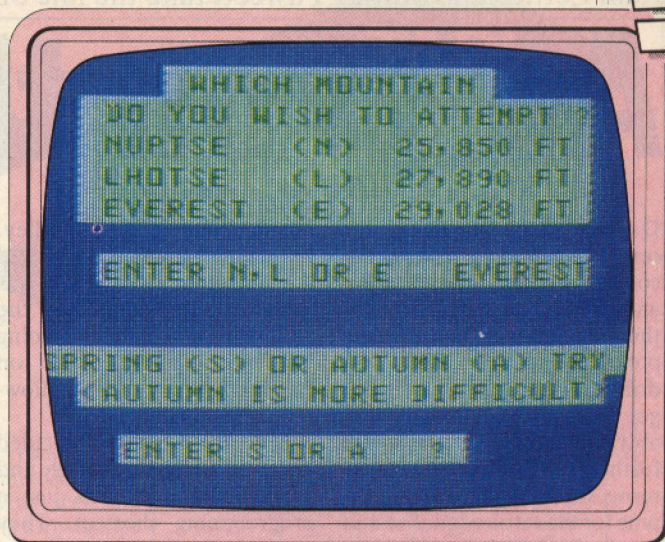
RATING

Lasting appeal

Playability

Use of machine

Value for money



DRAGON 32

Room at the top

Name Everest **System** Dragon 32
Price £7.95 **Publisher** Salamander, 17 Norfolk Road, Brighton, East Sussex
Format Cassette **Language** Basic
Other versions None **Outlets** Mail order, Spectrum shops, other dealers

How nice to encounter a game which doesn't demand a great deal of you — all you have to do here is climb Mount Everest.

Objectives

You scale Everest, or one of the two other lesser peaks also on offer, in a role-playing game that mixes text with high-resolution graphics and gives you the chance to take charge of a six-strong team and its supplies.

In play

Your first decision is which of the three Himalayan peaks you're going to attempt, and then you choose whether to mount your expedition in the spring or autumn, with spring being the easier time of the year.

You're told that you only have three or four weeks to complete the climb before the weather's too bad to continue.

Your next task is to split the 1800 lbs of supplies between food, tents, oxygen, ropes and ladders, though the program offers you a suggested split which you can opt for with the 'A' key. Each climber can carry up to 60 lbs at a time, and the supplies must be ferried slowly upwards to the various base

camps that are established on the mountains.

There is an information service provided, and this can be examined at any time, enabling you to check the weather forecast, the strength of your climbers, what each man is carrying, and the positions of both the climbers and the assorted supplies.

The graphics, which are not wonderful but amusing enough, come into effect when the climbers tramp between camps, and during these you must watch for bad weather, crevasses, avalanches or falls, some of which you can attempt to rectify by furious pressing of various keys.

My own climbers had an unfortunate habit of dying on me before I even approached the final climb to the peak, but after several attempts I was eventually able to mount a successful expedition on Nuptse, the smallest of the mountains.

At the end of this you're given a percentage rating to show how well (or otherwise) you've coped with that particular climb at that particular season.

Verdict

I'm not sure that this is the type of game you would want to carry on playing forever, but it is well done and it gave me several entertaining hours while I tried it out. Not as exhausting as the real thing, and rather cheaper than a trip to Tibet.

Mike Gerrard

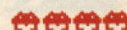
RATING

Lasting appeal

Playability

Use of machine

Overall value



PCN ProgramCards

ProgramCards covers the range of personal computing this week.

The first offering is for the ZX81, a micro not usually renowned for its graphical abilities. But with M J Plummer's utility program, you'll be able to create some impressive screen displays.

Display Dump is a very fast transfer method of moving the display file to and from a Basic string. The speed comes from a very efficient machine code routine only 34 bytes long and the whole program works in two methods.

The first allows a picture to be created on screen and then stored. When a series of pictures has been stored, they can be displayed in sequence giving true animation.

The second method allows for multiple moving objects to be shown on screen without the annoying flicker that usually accompanies moving graphics on the ZX81.

Moving slightly up-market, Oric owners will find the first of four cards for an enjoyable pastime called Meteor Shower

which features sound, graphics and a hall of fame.

Finally, a bonus for Commodore 64 owners this week with two programs from reader J R Mace. Both will prove entertaining and useful.

The first is an arithmetic test program featuring five levels of difficulty with questions on addition, subtraction, division and multiplication. The second might come in very handy for newcomers to

computing, or old hands finding that typing in listings can be a chore. This is a keyboard test and a few sessions with it should speed up your typing fingers considerably.

A RUN for our money

We pay for published programs on a sliding scale which take into account length, complexity, originality and the programming skill demonstrated in the program. So why not give us a RUN for our money?

As well as the cash, you receive the satisfaction of seeing your byline on the ProgramCard — which will, of course, be snipped out and filed away in the libraries of thousands of micro enthusiasts throughout the country.

Send your contribution, on disk or cassette, together with a plain paper listing and brief summary notes to:

The Programs Editor, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

All disks and cassettes will be returned as soon as possible after evaluation or publication, at our expense.

PCN Programs Editor

PCN wants you. That is, if you can understand and explain other people's programs, spot a bug in the heart of a listing, have done time on a number of micros running different dialects of Basic and have more than a passing familiarity with Pascal, Forth and other popular languages.

If this sounds like you, write with CV to: Cyndy Miles, Editor, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

PCN ProgramCards

Display Dump Card 1 of 2

8323DD1/2

A technique for the very rapid dumping and updating of the display file to and from a Basic string. Uses a 34-byte machine code routine.

```
1 REM 123456789 123456789 123456
789 1234
2 DIM D$(792)
3 DIM P$(6,72)
4 LET AD=16514
5 GOSUB 9000
6 FAST
10 FOR I=1 TO 6
20 CLS
30 FOR A=0 TO 2*PI STEP .1
40 PLOT I*2.5*COS A+32,I*2.5*SIN
A+21
50 NEXT A
60 RAND USR 16531
70 LET D$(765+I*2 TO)="BIG BANG"
```

ZX81 (16K) ZX Basic

Application: Graphics utility
Author: MJ Plummer

```
80 LET P$(I)=D$
90 NEXT I
95 SLOW
98 FOR J=1 TO 10
100 FOR I=1 TO 6
110 LET D$=P$(I)
120 RAND USR 16514
130 NEXT I
140 FOR I=6 TO 1 STEP -1
150 LET D$=P$(I)
160 RAND USR 16514
170 NEXT I
180 NEXT J
200 CLEAR
210 DIM D$(792)
```

1	REM for machine code (34 characters)	60	Allows printing on bottom lines
2	Display buffer must be first variable	70	Dump picture into D\$
3	Store for various pictures	80	Store picture in P\$array
4	Point to REM for machine code	98	Repeat demo 10 times
5	Load machine code	110	Recall selected picture to buffer
30-50	Draw circles with increasing diameter	120	Move buffer to display file
		140-180	Repeat loop with contracting circles

PCNProgramCards

Display Dump Card 2 of 2

8323DD2/2

```

220 DIM B$(792)
230 DIM T$(3,5)
240 CLS
250 RAND USR 16531
260 LET B$=D$
270 LET T$(1)=" <+> "
280 LET T$(2)="<===>"
290 LET T$(3)=" T T "
300 FOR J=1 TO 10
310 FOR Z=-16 TO 10
320 LET X=Z+16
330 LET Y=INT(Z*Z*0.08)
340 LET D$=B$
350 LET P0=X+2+33*Y
360 LET D$(P0 TO P0+5)=T$(1)
370 P0=P0+33
380 LET D$(P0 TO P0+5)=T$(2)
390 P0=P0+33
400 LET D$(P0 TO P0+5)=T$(3)
405 LET D$(792-X)="*"
410 RAND USR 16514
420 NEXT Z

430 NEXT J
8999 STOP
9000 LET A$="2A 10 40 11 06 00
19 ED 5B 0C 40 01 18 03 ED B0 C9
9010 GOSUB 9500
9020 LET A$="2A 10 40 11 06 00
19 EB 2A 0C 40 01 18 03 ED B0 C9
"
9030 GOSUB 9500
9040 RETURN
9500 PRINT AD
9510 IF A$="" THEN RETURN
9520 LET C=16*(CODE(A$)-28)
9530 LET A$=A$(2 TO)
9540 LET C=C+CODE(A$)-28
9550 LET A$=A$(3 TO)
9560 POKE AD,C
9570 LET AD=AD+1
9580 GOTO 9510
9997 CLEAR
9998 SAVE "DISPDEMO"
9999 GOTO 1

```

210-240	Reset all variables. Stores a blank screen		parts of spaceship on consecutive lines	9020	Machine code to move display to buffer. There must be a space at the end of A\$
270-290	Set up spaceship	410	Move updated buffer to display file	9500	Show start address of routine
300	Repeat ten times			9520-9540	Convert machine code to binary
310	Parabolic equation of motion			9550	Jump past hex digit and space
340	Blank the buffer	9000	Machine to move buffer to display	9560	Load binary to address
350-405	Calculate buffer index. The 2 allows for NEWLINE. Store	9010	Load machine code	9570	Point to next address

PCNProgramCards

Maths Test Card 1 of 4

8323MT1/4

A simple arithmetic test program offering five levels of difficulty

Commodore 64 Commodore Basic

Application: Quiz
Author: JR Mace

```

1 PRINT "J"
2 GOSUB 800
4 PRINT "J"
5 PRINT SPC(14) "MATHS TEST"
6 PRINT SPC(14) " "
10 LET J=1
20 LET K=0
25 PRINT:PRINT:PRINT
30 PRINT "CHOOSE ARITHMETICAL OPERATION"
40 INPUT A$
45 PRINT:PRINT:PRINT
50 PRINT "SELECT YOUR SKILL LEVEL"
51 PRINT "J"
90 IFA=1 THEN GOTO 150
100 IFA=2 THEN GOTO 180
110 IF A=3 THEN GOTO 250
120 IFA=4 THEN GOTO 320
130 IF A=5 THEN GOTO 360
135 IFA>5 GOTO 50
140 END

SPC(25) "(+,-,*,/)"
SPC(25) "(1,2,3,4,5)":INPUT A

```

1-6	Print instructions and title	25-50	Routine to select function
10	Register for total answered	90-140	Call appropriate test routine
20	Register for total correct		

PCNProgramCards**Maths Test Card 2 of 4**

8323MT2/4

```

150 LETX=INT(9*RND(1))+1
160 LETY=INT(9*RND(1))+1
170 GOTO390
180 IF A$="*" OR A$="/" THEN GOTO 220
190 LETX=INT(50*RND(1))+1
200 LETY=INT(50*RND(1))+1
210 GOTO390
220 LETX=INT(15*RND(1))+1
230 LETY=INT(15*RND(1))+1
240 GOTO390
250 IF A$="*" OR A$="/" THEN GOTO 290
260 LETX=INT(99*RND(1))+1
270 LETY=INT(99*RND(1))+1
280 GOTO 390
290 LETX=INT(30*RND(1))+1
300 LETY=INT(30*RND(1))+1
310 GOTO390
320 IF A$="*" OR A$="/" THEN GOTO 190
330 LETX=INT(500*RND(1))+1
340 LETY=INT(500*RND(1))+1
350 GOTO390
360 IF A$="*" OR A$="/" THEN GOTO 260
370 LETX=INT(1000*RND(1))+1
380 LETY=INT(1000*RND(1))+1
390 IF A$="-" AND X<Y THEN GOTO 90
400 IF A$="/" THEN GOTO 640

```

150-170 Skill level one and loop to
arithmetic operation

180-240 Level and loop for skill level two

250-310

320-350

360-400

Level and loop for skill level
three

Level and loop for skill level four

Level and loop for skill level five

PCNProgramCards**Maths Test Card 3 of 4**

8323MT3/4

```

410 IF J=11 THEN GOTO 710
420 LETJ=J+1
430 IFA$="+" THEN GOTO480
440 IF A$="-" THEN GOTO 580
450 IFA$="*" THEN GOTO 610
460 IF A$="/" THEN GOTO 670
480 LET Z=X+Y
490 PRINTX;"+";Y;"="
500 INPUT B
520 IFB=Z THEN GOTO 550
530 PRINT SPC(9) "NO,ANSWER=";Z
540 GOTO 90
550 LETK=K+1
560 PRINT SPC(9)"YES, THAT WAS CORRECT"
570 GOTO 90
580 LET Z=X-Y
590 PRINTX;"-";Y;"="
600 GOTO 500
610 LETZ=X*Y
620 PRINTX;"*";Y;"="
630 GOTO500

```

410-420 Sets max number of sums at ten

430-460 Loop to arithmetic operation

480-520 Prints random addition sum,

loop and check answer

530-570

580-600

610-630

Prints if correct or prints answer.

Get next sum

Prints random subtraction sum

and checking routine

As above but for multiplication

PCNProgramCards

Maths Test Card 4 of 4

8323MT4/4

```

640 LETZ=INT(X/Y)
650 IFNOT X=Z*Y THEN GOTO 90
660 GOTO 410
670 LETL=INT(11*RND(1))+1
680 LETX=(A*L)*X
685 LETZ=X/Y
690 PRINTX;"/";Y;"="
700 GOTO 500
710 PRINT:PRINT: PRINTSPC(20) "SCORE= ";K:PRINT:PRINT
711 IFK<5THENPRINTSPC(24)"*** POOR ***"
712 IFK<8ANDK>5THENPRINTSPC(24)"*** FAIR ***"
713 IFK<10ANDK>7THENPRINTSPC(24)"*** GOOD ***"
714 IFK=10THENPRINTSPC(24)"*** EXCELLENT ***"
715 V=54296:W=54276:A=54277:H=54273:L=54272
716 FORX=15 TO 0STEP-1:POKEV,X:POKEW,129:POKEA,15:POKEH,40:POKEL,200:NEXT
717 POKEW,0:POKEA,0
720 PRINT:PRINT" DO YOU WANT ANOTHER MATHS TEST ? PRESS ANY KEY TO START"
721 INPUT$
725 GETP$:IFP$=""GOTO4
800 PRINT"*****"
805 PRINT"THESE ARE 4 ARITHMETICAL OPERATIONS EACH WITH 5 LEVELS OF DIFFICULTY."
810 PRINT:PRINT"THIS PROGRAMME WILL RANDOMISE 10 SUMS AT YOUR SELECTED LEVEL."
815 PRINT:PRINT"CAN YOU GET A MAXIMUM 10 SUMS CORRECT ?"
820 PRINT"***** REMEMBER- PRESS RETURN AFTER EACH ANSWER"
825 FORX=1TO10000:NEXTX
830 RETURN

```

640-700 As above but for division
 710 Print final score
 711-714 Grade final score
 715-717 Initialise noise registers and
 play tone

720-725 Loop for another test
 800-820 Instructions
 825-830 Time loop

PCNProgramCards

Key Test Card 1 of 2

8323KT1/2

Commodore 64 Commodore Basic

Application: Utility/game
 Author: J R Mace

```

1 PRINT"J"
5 GOSUB310
7 POKE53280,6:POKE53281,3
8 PRINT"J"
10 PRINT SPC(7) "**** KEYBOARD SKILLS ****"
11 PRINTSPC(7)" "
12 PRINT:PRINT:PRINT
15 PRINT" TYPE THE KEY .....MAX SCORE 25"
16 FOR T=1 TO 5000
17 NEXT T
20 LETH=0
30 FORT=1TO25
40 FORI=1TO INT(RND(1)*300+1000)
50 NEXTI
60 LETA=INT(RND(1)*40)
70 LETD=INT(RND(1)*25)
80 LETP$=CHR$(INT(RND(1)*26)+65)
90 PRINT"J"
100 FORJ=0TOD
110 PRINT
120 NEXTJ
130 PRINTTAB(A);"J"P$
140 FORI=1TO500
150 GETR$

```

1-7 Initialise
 8-17 Title and time loop
 20 Set score to zero
 30 Set max number of letters for
 test
 40-50 Time loop for screen display

60-70 Select random co-ordinates for
 screen
 80 Select random letter
 90-140 Print letter
 150 Scan keyboard

PCNProgramCards

Key Test

Card 2 of 2

8323KT2/2

```

160 IFR$=P$THEN GOTO 210
170 IFR$<>" "THEN GOTO190
180 NEXT I
190 PRINT" MISSED":GOSUB500
200 GOTO230
210 PRINT" A HIT":GOSUB400
220 LETH=H+1
230 NEXT T
240 PRINT"J"
250 PRINT"XXXXXXXXXXXXYOU SCORED ";H;" /25"
260 PRINT"XXXXDO YOU WANT ANOTHER GO? Y / N"
270 INPUTB$
280 IFR$="Y"GOTO8
290 IFR$="N" GOTO300
300 END
310 PRINT"XXXXTHE PROGRAMME DISPLAYS A RANDOM ALPHABET LETTER ONTO THE SCREEN."
320 PRINT"XXTYPE THE LETTER BEFORE IT DISAPPEARS,BUT DO NOT TYPE AFTER THE TONE.
"
330 PRINT"XXONLY ONE ATTEMPT AT EACH LETTER."
340 PRINT"XXXXXXXX**PRESS ANY KEY TO CONTINUE**"
350 GETK$:IFK$=""GOTO350
360 RETURN
400 S=54272:POKES+24,15:POKES+5,100:POKES+1,25:POKES+0,177:POKES+4,17
410 FORP=1TO100:NEXT
420 POKES+4,0:POKES+5,0:POKES+6,0
430 RETURN
500 S=54272:POKES+24,15:POKES+5,100:POKES+1,12:POKES+0,216:POKES+4,17
510 FORP=1TO100:NEXT
520 POKES+4,0:POKES+5,0:POKES+6,0
530 RETURN

```

160	Check for correct answer	240-250	Print final score
170	Check for wrong answer	260-300	Check for another test
180-230	Print result and loop to next letter	310-360	Instructions
		360-530	Sound effects

PCNProgramCards

Meteor Shower Card 1 of 4

8323MS1/4

An arcade-type game. Note the use of the shorthand form of Print @,!

```

1 REM
2 REM METEOR SHOWER
7 TEXT:POKE623,27:CLS:POKE46419,62
8 HS=100:HS$="ORIC"
9 PRINTCHR$(6):PRINTCHR$(17):PRINTCHR$(20)
10 GOSUB700
20 S=0:F=500:LI=3
25 X=20
26 POKE623,25
30 F=500
35 PRINTCHR$(30);CHR$(11)
40 !RND(1)*38,2;"*":IFRND(1)>.7THEN!RND(1)*38,2;"*"
45 IFRND(1)>.87THEN!RND(1)*36+2,2;CHR$(129)"&"CHR$(128)
50 V=DEEK(783)
55 IFV=48255ANDX<37THENX=X+1
60 IFV=48351ANDX>1THENX=X-1
70 !X,24;"@"
72 F=F-5
80 C=SCRN(X+1,23)
85 IFC=42THENEXPLODE:GOTO200
90 IFC=38THENZAP:F=F+70:S=S+15:!X,23;" "
95 !7,26;CHR$(147);"SCORE:"S,"FUEL:"F"CHR$(150)
96 IFF<1THENPING:WAIT50:PING:GOTO200

```

Oric 1 (48K) Oric Basic

Application: Game
Authors: Craig Bartlett
& Robert Davies

7	Set screen attributes	55-70	Check movement of player
8	Set high score value and name		left/right
10	Call sub-routine for set up and instructions	72	Decrease fuel
20-30	Initialise variables	80	Scroll down one line
35-50	Print random meteors on screen with occasional fuel units	90	If fuel cell hit, update score and fuel
		95	Displays score and fuel
		96	Run out of fuel, lose a life

Continued next week



'Kids and the Vic' by Edward H Carlson, published by Prentice Hall at £16.95 (spiral-bound paperback, 210 pages).

You don't read this, you use it. And if you can you'll do so along with somebody else who is either as knowledgeable as yourself or more so.

Each of the 33 lessons is preceded by notes for the instructor and is rounded off with one or two assignments. So this straight-from-scratch manual, aimed at 10 to 14-year-olds, has that familiar feel of the school textbook.

It explains what you are aiming for in each lesson, tells you how to do it on your Vic, and then gives you a test that makes sure you've got it sussed. The idea is not to get ahead of yourself and get confused, but you may take best advantage of this if there are at least two of you to check the work in progress.

As any textbook should, it has answers to assignments at the back, plus glossaries, including one of error messages.

It encourages thoroughness in learning and approach and does get the reader onto more than a competent knowledge of core commands in Basic. But at times the attitude towards the young reader is patronising, and towards adults, pompous.

The drawings are not illustrations as such, since they shed little light on the text and in some cases could be a hindrance. *Kids and the Vic* is written for 10 to 14 year olds — why? Is there a *Grown-ups and the Vic*?

'The World Connection' by Timothy Orr Knight, published in the UK by Prentice/Hall for Howard W Sams at £8.45 (paperback, 140 pages).

The World Connection is about computer-to-computer communication via the telephone network. It's half overview and half handbook of equipment

and services for the budding micro communicator.

In the US there have been a number of installations such as the Source for several years now. The Source started life in 1979 providing a diverse range of services, including financial information, news, mailbox facilities, computer shopping and travel information. It has since been joined by others, including Compuserve.

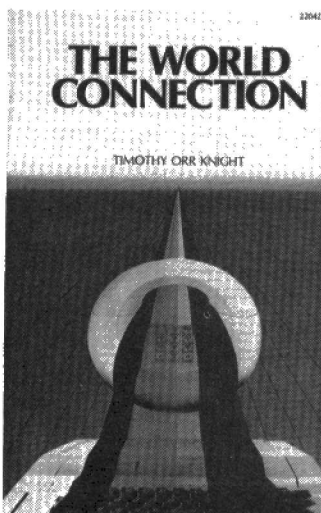
Compuserve offers a service called CB which, as the name suggests, enables users to download jargon call-signs to each other (calling *Rubber Ducky* — you know the sort of thing).

This, then, is the background to this book. It's been written by a 16-year-old who has spent the past three years manipulating his way through information services. He knows his stuff. The book is well-written and has a wealth of background information.

It is, however, decorated with rather facetious cartoons which are only occasionally helpful, and black and white photographs which have lost much in the translation to the printed page.

The product section is obviously based on American products — modems, software, terminals and so. It tells you what to look for, what you need and where you can get it in the US. He even includes prices (a risky decision in such a fast-moving field, price wise) and this reduces its attraction to UK enthusiasts. Its mediocre standard of production makes its £8.45 price-tag seem a bit high.

Even so, with services like Micronet beginning to make themselves felt here *The World Connection* should be good reading for the communications enthusiast. **IS**



GET MORE FROM THE VIC 20



'Get More from the Vic 20' by Owen Bishop, published by Granada at £5.95 (paperback, 185 pages).

One of the problems for the Vic owner with some computing experience and looking for a good guide to extend that knowledge is that while there are many books for the beginner, there are few that go beyond the basics.

Unfortunately Owen Bishop has produced a volume that repeats a great deal of information previously published. While there are tidbits of advanced programming technique, he has aimed his book largely at the beginner to computing, or the new Vic owner.

It covers all the usual aspects of learning Basic, starting off with background information on computing, using the language gradually working up to the intricacies of PEEK and POKE.

There are illustrative programs along the way and these are accompanied by explanations.

The other chapters follow a similar format of introducing new commands with short programs and explanations, finishing with a summary of what has been learned.

Sound and graphics are covered in depth. If you're interested in the latter, user-defined graphics are explained better here than in the user's manual and programmer's reference guides for the Vic, while the sound section includes an excellent program that will allow you to experiment with different sound effects without having to enter line after line of POKEs.

In addition, there are useful advanced sections on sorting, including sample string and variable sorts, and a commendable chapter on better program-

ming techniques. The latter covers documenting programs, and programming for helpful input and output.

To round off the book there are a dozen helpful tables, although most of the material is already available in the user's manual. **TJ**

'Simplified Guide to Small Computers for Business' by Daniel R McGlynn. Published by John Wiley & Sons at £14.20 (paperback, 240 pages).

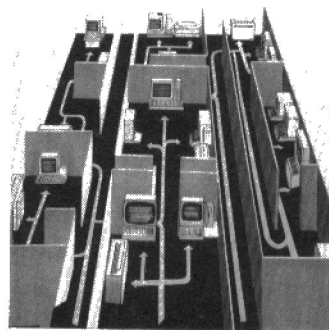
This is yet another effort to introduce businessmen to the ins and outs of small business computers. Explaining the benefits and pitfalls of microcomputing to a novice is no easy task because all the terms of reference must be defined. But it is usually a proud boast in books of this kind that the technicalities of the subject are avoided. In practice, however, these two objectives are rather difficult to reconcile — you have to explain the technicalities to a certain extent if everything is to fall into place for the reader.

For the businessman or professional who wants to acquaint himself with microcomputers, the only advice is to read and ask questions. One book and one approach won't be enough, but my feeling is that this book could provide one of the building blocks.

It's an American book (prices are in dollars) but the background material is obviously applicable to UK readers. It explains the hardware, peripherals, software, applications and how to go about buying and installing. It's all very thorough and useful stuff, though obviously some of the more specific detail — leasing, vendors and so on — will have to be mentally adapted by the reader to the UK market. **IS**

SIMPLIFIED GUIDE TO SMALL COMPUTERS FOR BUSINESS

Daniel R. McGlynn



Clubnet keeps you in touch with enthusiasts throughout the UK. It is divided into clubs and user groups. We publish a list of these groups on alternate weeks. This week clubs are listed alphabetically by county and town. Each week we focus on an individual club or group with a fly-on-the-wall report. If your

association has something special on the agenda or if you've just started a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

The clubs listing is based on that of the Association of Computer Clubs.

Commodore in common

Many are faced with problems when they first get a computer. 'Our group is there to help', said Brian Grainger, one of the organisers of the North Hertfordshire Independent Commodore Products User Group.

'I must emphasise that we are in no way sponsored — we are independent as our name suggests. However, Commodore supplies equipment for us to test and technical people to answer our queries,' added Mr Grainger.

He himself has a Commodore 64 which he is using to develop Comal. 'At the moment software for this language is available free through the user group.'

Another member, Richard Lewsey, has programmed his Commodore 4032 to connect with Prestel and also to provide hard copy of the pages via a printer. 'The software has to be modified to allow the print facility,' he said, 'but it only took a few evenings and a couple of lunchtimes to do. The character set had to be changed because of the use of graphics, so some hardware alteration was needed as well.'

Machines used range from the hobbyists' Vic 20s employing programs with titles like O'Riley's Mine, to a Commodore Pet 8032 business machine being used by antique dealer Arthur Bexford for accounts work.

The user group has been in its present



Brian Grainger at the North Herts Independent Commodore User Group meeting. He is currently using his Commodore 64 to develop Comal.

form for about two years. It is an informal one and runs no organised activities such as talks or courses. It meets on the last Wednesday of every month and attracts a healthy thirty to forty enthusiasts of all ages on each occasion.

Janice McKenzie

Name The North Hertfordshire Independent Commodore User Group **Venue** Office premises, Purwell Lane, Hitchin **Meetings** Last Wednesday in the month **Contact** Brian Grainger, 73 Minehead Way, Stevenage, Herts.

USER GROUPS

Acorn

Coventry Acorn Atom User Group. Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Kent Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Sessions at 9pm Thursday at the Fox and Hound, Chatham. Clem Rutler, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (evenings).

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crupsall, Manchester 8 on Tuesday except school holidays. John Ashurst, 192 Vendure Close, Fallowfield, Manchester, 061-681 4962.

Apple

Ashted Apple User Group. Meets first Monday of every month. Contact M Lawrence, 15 Petters Road, Ashted, Surrey.

British Apple Systems User Group. PO Box 174, Watford WD2 6NF.

British Apple Systems User Group. Meets first Tuesday evening and third Sunday afternoon every month at Old School, Branch Road, Park Street, St Albans. Subs: £12.50+£2.50 joining. Contact D Bolton, 0727 72917.

Birmingham & Region Apple Group. Contact Mel Golder, 021-426 2275.

Bristol Apple Users and Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Ewa Dabkowski, c/o Datalink, 10 Waring House, Redcliffe

Hill, Bristol BS1 6TB, 0272 213427.

Buckinghamshire Apple User Group. Steve Profitt, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 062 84 73074.

Chelmsford Apple Users Club. Proposed new club. Contact D Beckingham, 571 Galleywood Road, Chelmsford, tel: Chelmsford 66948.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

London Apple Music Synthesis Group. Dr Davis Ellis, 22 Lennox Gardens, London SW1.

South-East London Apple User Group (Appletree). Contact John Grieve at 106 Maran Way, Erith, Kent or phone 01-311 7681.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Brian Pain, Sir Frank Markham School, Woughton Centre, Chaffron Way, Milton Keynes.

Atari

Birmingham User Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Mike Aston, 42 Short Street, Wednesbury, West Midlands.

Carshalton Atari User Club. Paul Deegan, 01-642 5232.

Essex. Contact John Sarrar, 138 Frederick Road, Rainham, Essex, tel (76) 22077. Meets at Rainham Town Football Club, 7.30pm, second and fourth Friday of each

month.

Hull Atari Users Local Group. Harvey Kong Til, 546 Holderness Road, Hull HU9 3ES. Hull 7911094.

London Silica Atari 400/800 User Club. Richard Hawes, 01-301 1111.

Manchester Atari Computer Enthusiasts. Meets at The Ellesmere, Worsley Road, Worsley, on the second and last Thursday of every month. Contact Martin Davies, Bolton 700757.

Norwich Atari User Group. Ken Ward, Norwich 661149.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merriem House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Roger Taylor, 0253 738192.

UK Atari Computer Owners Club. Contact PO Box 3, Raleigh, Essex.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Nick Kelly, 051-525 2934 (evenings).

BBC

Laserbug is an international user group for the BBC micro. Paul Barbour, 10 Dawley Ride, Colnbrook, Slough, Berks, 02812 30614.

Beebug. Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Bournemouth BBC User Group. Meets at

Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at 7.30pm. Norman Carey, 0202 749612.

Brent/Barnet User Group. Meets on last Sunday of month. Joseph Fox, 4 Harman Close, London NW2 2EA.

Charlton & District (South Manchester) BBC Micro User Group. Contact Philip Harrison, 34 Holwood Drive, Manchester M16 8WS.

Chelmsbug. Contact Ian on Chelmsford 69174.

Cardiff BBC Microcomputer Club. Meets alternate Wednesdays at Applied Science Lecture Theatre, University College, Newport Road, Cardiff.

Liverpool BBC & Atom Group. Meets on the first Wednesday of every month at Old Swan Technical College, Room C33, 7.30-9.30pm, and on the third Thursday at Birkenhead Tech. College, 7.30-9.30pm. Contact Nik Kelly, 56 Queens Drive, Walton, Liverpool L4 6SH.

North London BBC Micro Users Group. Meets at The Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Dr Leo McLaughlin, Westfield College, University of London, Kidderpore Avenue, London NW3 7ST, 01-435 0109.

Norwich & District BBC Microcomputer User Group. Meets at Norwich City College on the first and third Tuesday of every month at 7pm. Subs: £3; students and OAPs £1.50. Contact Paul Beverley, Department of Electronics, Norwich City College, Ipswich Road, Norwich NR2 2LJ.

Preston area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane,

Preston, on last Thursday of month.
Duncan Coulter, 8 Briar Grove, Ingol,
Preston, Lancashire, 0772 725793.
Tyne & Wear BBC User Club. Contact Ian
Waugh, 13 Briardene Drive, Wardley, Tyne
& Wear NE10 8AN.

Wellingborough BBC Owners User Group.
Contact R Houghton, 49 Addington Road,
Irthlingborough.

**Witham (NAMEBUG) BBC Micro User
Group.** Meets at comprehensive school,
Witham on second Thursday each month at
7.30pm. Dave Watts 0245 358127 after
7pm.

Comal

London Comal User Group. Meets at
Polytechnic of North London, Holloway,
second Wednesday of month, term time.
John Collins, 75 74111.

Commodore ICPUG

Basildon. Contact Walter Green, 151 The
Hatherley, Basildon, Essex.

Bloxham. Contact John Temple,
Kirabanda, Rose Bank, Bloxham, Oxon.

Barnsley. Bob Wool, 13 Ward Green,
Barnsley, South Yorkshire, 0226 85084.

Blackpool. Meets at Arnold School,
Blackpool, on third Thursday of month.
David Jarrett, 197 Victoria Road, Thornton
Cleveleys, Blackpool FY5 3ST.

Birmingham. Contact J A McKain, PPI Ltd,
177 Loddells Road, Birmingham, tel:
021-544 0202.

Bournemouth & Poole. Contact Douglas
Shave, 97 Canford Cliffs Road, Poole,
Dorset BH13 7EP.

Bury St Edmunds. Contact Alan Morris, 30
Kelso Road, Bury St Edmunds, Suffolk.

Burnley. Contact John Ingham, 72 Ardwick
Street, Burnley, Lancashire.

Canterbury SE. Meets at The Physics Lab,
Canterbury University, on first Tuesday and
Wednesday of month. R Moseley,
Rosemount, Romney Hill, Maidstone, 0622
37643.

Carrickfergus. David Bolton, 19
Carrickburn Road, Carrickfergus, Antrim
BT38 7ND, 09603 63788.

Chelmsford. Contact A G Surridge, 97
Shelley Road, Chelmsford, Essex.

Cheltenham. Meets at the Cheltenham
Ladies College on last Thursday of month at
7.30pm. Alison Schofield, 78 Hesters Way
Road, Cheltenham, Gloucester, 0242
580789.

Clwyd. John Poole, 6 Ridgway Close,
Connah's Quay, Clwyd CH5 4LZ.

Corby. Peter Ashby, 215 Wincobn Way,
Corby, Northamptonshire, 05363 4442.

Coventry. Meets at Stoke Park School and
County College at 7pm on fourth
Wednesday of month except July, August,
December. Will Light, 22 Ivybridge Road,
Styvechale, Coventry, Warwickshire.

Derby. Meets at Derby Professional Colour
every other Tuesday at 7pm. Robert Watts,
03322 72569.

Derbyshire & District. Meets every other
Monday, 7-9pm at Davidson Richards Ltd,
14 Duffield Road, Derby. Contact Raymond
Davies, 105 Normanton Road, Derby DE1
2GG.

Devon. Contact Matthew Stibbe, The Lawn,
Lower Woodfield Road, Torquay, Devon.

Durham. North-East Pet and ICPUG. Meets
at Lawson School, Burnley at 7pm second
and third Mondays. Jim Cocalis, 20
Worcester Road, Newton Hall Estate,
Durham.

North-East-Durham. Meets at Lawson
School, Burnley on the second and third
Monday every month at 7pm. Contact Jim
Cocalis, 20 Worcester Road, Newton Hall
Estate, Durham, 0385 67045.

Dyfed. Simon Kniveton, 097 086 303.

Gosport. Meets at Bury House, Bury Road,
Gosport, Hants at 7pm. Contact Tony Cox,
10 Staplers Reach, Rowner, Gosport,
Hants.

Hainault. Meets at Grange Remedial
Centre, Woodman Path, Hainault. Carol
Taylor, 101 Courtlands Avenue, Cranbrook,

Ilford, Essex.

Glasgow. Dr Jim MacBrayne, 27 Daidmyre
Crescent, Newton Mearns. Glasgow,
041-639 5696.

Gloucester and Bristol Area. Meets at 23
Sheppard Leaze, Wotton-under-Edge,
Gloucester, on last Friday of month.
Hampshire. Meets at 70 Reading Road,
Farnborough, on third Wednesday of
month. Ron Geere, 109 York Road,
Farnborough, Hants, 0252 542921.

Gosport. Contact Brian Cox, Bury House,
Bury Road, Gosport, Hants, Fairham
280539.

Hants. Contact Tony Cooke, 7 Russell
Way, Petersfield, Hampshire GU31 4LD.

Hertfordshire North. Meets at Provident
Mutual Assurance, Purwell Lane, Hitchin,
on last Wednesday of month. B Grainger,
73 Minehead Way, Stevenage, Herts SG1
2HS, 0438 727925.

Kilmarnock. Meets at Symington Primary
School on first and third Thursday of month
at 7pm. John Smith, 19 Brewlands Road,
Symington, Kilmarnock KA1 5RW, 0563
830407.

Liverpool. Meets at The Merchant Taylor
School for Boys, Crosby, on second
Thursday of month at 7pm. Tony Bond, 27
Ince Road, Liverpool L23 4UE, 051-924
1505.

Llandyssul. Contact F Townsend, The Hill,
Rhydowen, Llandyssul, 05455 5291.

London. Alan Birks, 135 Queen Alexandra
Mansions, Judd Street, London WC1,
01-430 8025.

London North. Barry Miles, Department of
Business Studies, North London
Polytechnic, Holloway Road, London N7,
01-607 2789.

National. Contact Membership Secretary,
30 Brancates Road, Newbury Park, Ilford,
Essex IG23 7EP.

Norfolk. Proposed new club. Contact J
Blair, 7 Beach Road, Cromer, Norfolk.

Maidstone. Meets on the first Wednesday
of every month contact Ron Moseley, Lord
Romney Hill, Weaving Maidstone, Kent,
0622 37643.

Norfolk. Peter Petts, Bramley Hale,
Wretton, King's Lynn, Norfolk PE33 9QS,
0366 500692.

Manchester. Contact Clive Embrey, 17
Santon Avenue, Fallow Field, Manchester.

Mapperley. Meets at Arnold & Carlton
College, Digby Avenue, Mapperley every
Friday. Contact Mark Graves, 8 Digby Hall
Drive, Gunthorpe Road, Gedling, Notts
NG4 4JT.

Northumberland. Graham Saunders, 22
Front Street, Guide Post, Northumberland.

Rhyl. Contact Frank Jones, 77 Millbank
Road, Rhyl, Clwyd, 0745 54820.

Slough. Meets at Slough College on second
Thursday of month at 7.30pm. Brian
Jones, 53 Beechwood Avenue, Woodley,
Reading RG5 3DF, 0734 661494.

South-East. Regional Group. Meets at
Charles Darwin School, Jail Lane, Biggin
Hill, Kent, on third and fourth Thursday of
month at 7.30pm. Jack Cohen, 30
Brancaster Road, Newbury Park, Ilford,
Essex, 01-597 1229.

South Midlands. Meets at 12 York Street,
Stourport-on-Severn on last Thursday of
month. M J Merriman at above address.

Staffordshire. 57 Clough Hall Road,
Kilsgrove, Stoke-on-Trent.
Teddington. G Squibb, 108 Teddington
Park Road, Teddington, Middlesex, 01-977
2346.

Watford. Meets on second Monday of
month. Stephen Rabagtiati, c/o Institute of
Grocery Dist. Grange Lane, Letchmore
Heath, Watford, Herts, 01-779 7141.

Witney. Contact Ian Blyth, 40 Wilmot
Close, Witney 5171.

Wolverhampton. Meets monthly. Contact J
Bowman, 6 The Oval, Albrighton,
Wolverhampton, West Midlands.

Commodore Pet

Blackpool. West Lancashire Pet Users
Club. Meets at Arnold School, Blackpool on

the third Thursday of month. D Jowett, 197
Victoria Road, East Thornton, Blackpool
FY5 3ST.

Southern Users of Pets Association.

Howard Pilgrim, 42 Compton Road,
Brighton BN1 5AN.

Pet User Group Crawley. Richard Dyer, 33
Parham Road, Ilfield, Crawley.

Pet Users Education Group. Dr Chris
Smith, Department of Physiology, Queen
Elizabeth College, Camden Hill Road,
London W8 7AH.

UK Pet Users Club. 360 Euston Road,
London NW1 3BL.

Pet Users Group. Meets at Polytechnic of
North London, Eden Grove, Room 320. On
alternate Tuesdays, 6pm. Barry Miles
01-607 2789.

Pet User Club. Margaret Gulliford, 818
Leigh Road, Slough Industrial Estate, 0753
74111.

Independent Pet Users Group. 57 Clough
Hall Road, Kielsgrove, Stoke-on-Trent,
Staffordshire.

Commodore Vic

National Association of Vic-20 Owners.

Contact S Tomananek, 20 Milner Road,
Sherwood, Nottingham.

Burnley. John Ingham, 72 Ardwick Street,
Burnley, Lancashire.

Clwyd. Contact A Stanners, 192A Willow
Park, Queensferry, Deeside, Clwyd, Wales,
816603.

London. Vic Users Group. Meets on
alternate Tuesdays at 6.30pm at
Polytechnic of North London, Community
Centre. Robin Bradbeer.

London. Contact Jim Chambers,
Department of Psychology, University
College London, Gower Street, London,
WC1, 01-387 7050 x 413. Meets at

University College, 26 Bedford Way,
London WC1, third Tuesday of each month
at 8pm.

Norfolk. J Blair, 7 Beach Road, Cromer,
Norfolk, 0263 512849.

Compucolour

Caversham. Compucolour Users Group

UK. Meets at Community Centre,
Caversham Park Village twice a year. Peter
Hiner, 11 Pennycroft, Harpenden,
Hertfordshire, 05827 64872.

CP/M

Irish CP/M Users Group. Meets monthly in
Dublin area. Doug Nottley, Gardner House,
Ballsbridge, Dublin 4, Dublin 686411.

London. CP/M User Group (UK). Subs
£7.50. Produces newsletter. Contact David
Powys-Lybbe, 01-247 0691.

UK CP/M Users Group. Lesley Spicer, 11
Sun Street, London EC2M 2QD, 01-247
0691.

COSMAC

COSMAC Users Group. James
Cunningham, 7 Harrowden Court,
Harrowden Road, Luton, Bedfordshire,
0582 423934.

Decus

Decus UK & Ireland. Contact Tracey
Pardoe, DECUS, PO Box 53. Reading,
Berks RG2 0TW.

Digital Equipment

Digital Equipment Users Society. The
Secretary, PO Box 53, Reading, Berkshire,
0734 387725.

Dragon

Brixham Dragon Owners Club. Meets at
Computer Systems (Torbay), Pump Street,
Brixham, every Saturday at 2.30pm. Ian
Chipperfield, 22 Brookdale Court, Brixham,
Devon, Brixham 59224.

Epson HX20

London. Contact Terence Ronson, 25
Sawyers Lawn, Drayton Bridge Road,
Ealing, W13, 01-998 1494.

Greater Manchester. Contact Melvin

Franklin, 40 Cowlees, Westthoughton,
Bolton, Lancs.

Luton. The Dragon's Den. Contact D
Buckingham, 83 Neville Road, Limbury,
Luton, Beds.

Education

Birmingham. Education ZX80/81 User
Group. Eric Deeson, Highgate School,
Balsall Heath Road, Highgate, Birmingham
B12 9DS.

Birmingham. MUSE. National body for
co-ordinating activity in schools, colleges.
Lorraine Boyce, MUSE Information Office,
Westhill College, Weoley Park Road,
Birmingham, 021-471 3723.

Dublin. Computer Education Society of
Ireland. Dairmuid McCarthy, 7 St Kevins
Park, Kilmacud, Blackrock, Co. Dublin.

Middlesex. Educational Users Group.
Offshoot of National TRS-80 Users Group.
Dave Fletcher, Head Teacher, Beaconsfield
First and Middle School, Beaconsfield
Road, Southall, Middlesex.

Worcestershire. Mini and Microcomputer
Users in Education. National organisation.
R Trigger, 48 Chadote Way, Catshill,
Bromsgrove, Worcestershire B61 0JT.

Forth

Forth Users Group. David Husband, 2
Gorleston Road, Branksome, Poole, Dorset
BH12 1NW, 0202 764724.

Forth Interest Group UK. Meets at Room
408, South Bank Polytechnic on the first
Thursday of month. K Goldie-Morrison, 15
St Albans Mansion, Kensington Court
Place, London W8 5QH, 01-937 3231.

Forum

Forum 80 Users Group. Frederick Brown,
421 Endike Lane, Hull HU6 8AG.

FX-500P

FX-500-P Users Association. Max Francis,
38 Grymsdyke, Great Missenden,
Buckinghamshire HP16 0LP.

Genealogists

**Society of Genealogists Computer Interest
Group.** Anthony Camp, 01-373 7054.

Genie

Colour Genie User Group. Details of
meetings/membership from Pat Doohan,
secretary, Nottingham (0602) 278791.

Intel MDS

UK Intel MDS Users Group. Lewis Hard,
c/o S. P. A. C.E., The Old Coach House,
Court Row, Upton-on-Severn, Worcester
WR8 0NS.

Ithaca Audio \$100

Ithaca Audio \$100 Users Group. Dave
Weaver, 41 Dore Avenue, North
Hykenham, Lincoln LN6 8LN.

Jupiter Ace

Jupiter Ace Users Group. John Noyce,
Remsoft, 18 George Street, Brighton BN2
1RH.

Lynx

National Independent User-Group. Subs
£9. Contact Robert Poat, 53 Kingswood
Avenue, Sanderstead, South Croydon CR2
9DQ.

Mattel

Mattel Intellivision TV Game Group.
Warrington 62215 after 4pm.

Medical

Durham. Primary Health Care Group. Dr
Alastair Malcolm, British Computer
Society, Cheveley Park Medical Centre,
Belmont, Durham, 0385 64282.

London. Medical Micro Users Group.
Medicom, 1-2 Hanover Street, London W1.
Middlesex. TRS-80 Medical and
Laboratory Users. Dr Robinson, The
Residency, Northwick Park Hospital,
Harrow, Middlesex.

Micronet

Micronet Independent User Group. Contact George Foot, Prestel Mailbox No. 892852867.

Nascom

Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Mike Rothery, 37 Eaton Wick Road, Eton Wick, Windsor, Berkshire, Windsor 56106.

Birmingham Nascom User Group. Meets at Davenports Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Martin Sidebotham, 021-744 3093.

International Nascom Microcomputer Club. 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.

Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Mr T Searle, 051-526 5256.

Newbrain

Wakefield Independent Newbrain User Group. Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.

Welwyn. Contact Angela Watkiss, 4 Ninnings Lane, Rabley Heath, Welwyn, Herts AL6 9TD.

Ohio

Ohio Scientific User Group. Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric

Oric Owners Group. Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.

Kent. Contact Roger Pyatt, 23 Arundel Drive, Orpington, Kent with SAE or call 66 20281.

Osborne

British Osborne Owners Group. J Anglesea, Flat 19, Rowan House, Mitton Road, Handsworth, Birmingham B20 2JR.

OSI

OSI UK User Group. Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal

Pascal User Group. Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP

Buckinghamshire. PDP8 User Group. Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.

Hertfordshire. PDP11 User Group. Pete Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot

UK Pilot User Group. Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel

ACC National Prestel Committee. Administrates Club Spot 800 (hobbyists on Prestel). Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines

Birmingham. Research Machines 380Z Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.

Leamington Spa. West Midland RML User Group. Spencer Instone, c/o 59 Avenue Road, Leamington Spa.

Newcastle. NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic, 0632 326002.

Oxford. Research Machines National User Group. RML, Mill Street, Osney, Oxford OX2 0BW, 0865 249866.

Oxford. Research Machines Ltd National User Group. M D Fisher, PO Box 75, Oxford OX4 1EY.

RML

West Midlands RML User Group. Contact 0926 38751.

Sharp MZ80

Aberdeen. International Sharp Users Group. Graham Knight, c/o Knights Computers, 108 Rossmount Place, Aberdeen, 0224 630526.

Essex. Sharp MZ80K User Group. Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.

Leeds. Sharp PC1211 Users Club. Jonathan Dakeyne, 281 Lidgett Lane, Leeds LS17 3AQ.

Somerset. Sharp MZ80 Users Club. Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair

Brighton. ZX Users Group. J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.

Aylesbury. Sinclair ZX Computer Club. Ken Knight, 0296 5181.

Colchester. Sinclair User Group. Meets fortnightly. Richard Lawn, 102 Pettygate Road, Colchester, Essex.

Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Mike Hayes, 54 Oakley Place, Grangetown, Cardiff. 0222 371732.

Doncaster & District Sinclair User Group meets at St Andrews Hall, Morley Road, Wheatley, Doncaster, every Wednesday except the first in each month. Contact John Woods, Doncaster 29357.

Edinburgh. ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh, on second and fourth Wednesdays every month, 7.30pm. John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.

Essex. Contact M Burnett, 24 Inverness Drive, Hainault, Ilford, Essex.

Glasgow. ZX80/81 User Group. Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.

Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Keith Archer, 051-260 4950.

London. National ZX User Club. Tim Hartnell, Interface, 44-48 Earls Court, London W8.

London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block. Monday, 6.30pm. Irving Brand, Polytechnic of North London, Holloway Road, London.

Manchester. Sinclair Computer Users Club. Proposed new club. Contact Colin Rushby, 061-881 6592.

ZX Spectrum Club. D Beattie, 63 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Scunthorpe. Grange Farm ZX Computer Club, Scunthorpe, South Humberside. Meets first and third Tuesday of month. Contact Sheila & Fred Wilkinson, 0724 842970.

Staffordshire. ZX80 National Software Association. 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.

Suffolk. ZX Amateur Radio User Group. Paul Newsman, 3 Red House Lane, Leiston, Suffolk. SAE essential. No telephone inquiries.

Surrey. Guildford ZX80/81 Users Group. Meets Fridays. A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.

Surrey. ZX80/81 User Club. David Bigden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.

West Sussex. Hassocks ZX Micro User Club. Paul King, 25 Fir Tree Way, Hassocks, West Sussex.

Sirius

Sirius User Group. Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-71 Gordon Street, Luton, 0582 412215.

68XX

68XX Special Interest Group. Tim Turner, 63 Millais Road, London E11 4HB, 01-558 3681.

6809 User Group

6809 User Group. Produce bi-monthly newsletter. Contact Mr Gibbons, Clarence Lodge, Hurdon Road, Launceston, Cornwall PL15 9DB.

Software

London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Mike Duck at Polytechnic of North London, Holloway, London N7.

Oxford. Program of the Month Club. Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer

Liverpool European Sorcerer Club.

Monthly meetings. Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 07048 72137.

Surrey. Exidy Sorcerer User Group. Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet

International Electronic Spreadsheet

Users Group. UK Alpha House, 7th Floor, Rowlandsway, Manchester M22 5RG.

Tangerine

Avon. Tangerine Users Group. Bob Green, 1 Marlborough Drive, Worle, Avon, 0934 21315.

Bristol. Tangerine Homebrew. A Coales, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.

Texas Instruments

Brighton. Contact Clive & Audrey Scally, 40 Barrhill, Patcham, Brighton, Sussex.

Ireland. Proposed new club. Contact Mrs Ann Flynn, 53 Georgian Close, North Road, Drogheda, Co. Louth, Eire.

Leeds. T199/4A User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. I Youlden, 0532 401408.

Manchester. T1 User Group. T Grimshaw, 21 Allingham Street, Longsight, Manchester.

Manchester. T199 Club. Contact Tim Grimshaw, 21 Allingham Street, Longsight, Manchester, 061 0374.

Manchester. T19900 User Group. Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.

Triton

Triton User Group. Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80

Birmingham. National TRS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.

Chelmsford. TRS-80 User Group. Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. J Dunn, 8 Ettrich Terrace, North Gateshead, County Durham.

Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month. Dick Mackie, 72 Morningside Drive, Edinburgh EH9 1DX, 031-447 6651.

Herts. Contact Reg Smith, 24 Sempill Road, Hemel Hempstead, Herts, 0442 60085.

Hull & District TRS-80/Beeb Users Group. Meets second Tuesday of month and Thursday 16 days later at Psychology Dpt,

Hull University. Contact J Lawrence, 2a Hall Road, Hull HU6 8SA.

Isle of Wight. TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month. 7.30pm. Sean Coulson, 0903 614589.

Kent. TRS-80 User Group. Alan Reid, 22 Woodways Road, Rainham, Kent, 0634 367012.

Greater Manchester. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancs.

Lancs. TRS-80 Colour Computer Group. Subs: £3. Contact Ian Wild, 53 Darnton Road, Ashton-U-Lyne, Lancs OL6 6RL.

Liverpool. UK DOSPLUS User Group. Peter Toothill, 101 Swanside Road, Liverpool L14 7NL. 051-220 9733.

Liverpool. Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month. 7.15pm. Peter Toothill, 101 Swanside Road, Liverpool L14 7NL. 051-220 9733.

London, SW. TRS-80 User Group. Ron Everitt on 01-394 2123.

Merseyside. TRS-80 User Group. N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.

Milton Keynes. National TRS-80 and Genie User Group. Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.

Nottingham. TRS-80 Genie Users Group. Meets at Wilford Moderns Rugby Club House on first and third Wednesday every month at 7.30pm. Contact Geoffrey Hillier, 5a Gregory Street, Lenton, Nottingham NG7 2LR, Nottingham 783938.

London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Dr Nick Robinson, Central Room, The Residency, Northwick Park Hospital.

Northants. TRS-80 User Group. Meets at Welwyn Park Community Centre on alternate Thursdays at 7pm. Neil Griffiths, 0858 65718.

Nottingham. East Midlands TRS-80 User Group. Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU, 0602 751753.

West Herts 80 User Group. Meets at St Stephen's Parish Centre, Station Road, Brickett Wood, St Albans, Herts. Tuesday evenings fortnightly. Contact Reg Smith, 24 Sempill Road, Hemel Hempstead.

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Dragon 32 plus joysticks plus games, eg Dragontrak, Datatank, Spacewar, for £180. 4 Levedale Road, Penkridge, Staffordshire ST19 5AT. Tel: Penkridge 3057.

Lynx 48K, six months old, excellent condition includes user manual plus Lynx Computing book, demo tape and Monster Mine £185 ovno. Tel: 0480 213587.

Pet 32K including twin disk drive £499 ono. Tel: 021-454 6447 weekday evening.

Acorn Atom 12K-ROM, 12K-RAM, 6522 VIA + bus buffers, boxed, tape recorder, PSU, all leads, manuals, Magic Book, programs, £175. Tel: Milton Keynes 0908 582265.

Apple II+ disk interface cards DOS 3-2 £25, DOS 3-3 £30, Versawriter plus five disks £65, also original software half price. Tel: Martin, Bristol 514698.

Commodore Pet 2001 8K, manuals, programming and reference book. Much software. Excellent condition. £170. Tel: Weybridge 47472.

Atari owners, disk drive wanted will swap for over £300 software, or for 48K RAM board, will sell or swap software as well. Tel: 0767 260470 (after 6pm).

Vic 20 Commodore 16K £25. Super Expander plus graphics book £25, Speech Synthesiser £15, Music Composer £15, various software. Tel: A J Ayling 01-679 3425, 84 Donnybrook Road, London SW16 5AZ.

ZX81 16K, transformer and leads, manual, games: Sorcerer's Island, Asteroids, Super Programs 5, still boxed, bargain at just £35. Tel: Brighton (0273) 779060, (Jacob).

TRS 80/Genie software. Kansas Editor Assembler £12, Master Monitor £10, Ascertain £3, all for £20. Richardson, 35 Banks Avenue, Ackworth, Pontefract, West Yorkshire. Tel: 0977-610168.

Wanted, printed suitable Sinclair 48K Spectrum. Devonport Old Forge, High Street, Barkway, Nr Royston, Herts.

Aculab floppy tape system £125, complete with free TRS 80 Model I Level II 48K computer, all in mahogany desk console. Tel: Waterlooville Hants 66398.

Tandy pocket computer and printer/cassette interface, all leads, manuals and mains adaptor, also games software, excellent condition, just £50. Tel: 0902 894775 after 6pm.

Atari VCS, as new with seven cartridges. Including Asteroids, Space Invaders, Maze Craze, Missile Command, Defender, Adventure and Combat, all for £100! Tel: 01-994 8341 (after 6pm).

Texas TI 99/4a with joysticks, cassette, games, still under guarantee £120. Tel: Woking 67454 (eve). D Watson, 18 The Moorlands, Kingfield, Woking, Surrey, GA22 9BJ.

Tandy PC1 Pocket Computer, printer, cassette recorder, interface, software, spare batteries, paper rolls etc, complete system only £69. 4 Sutherland Place, Clifton, Bristol BS8 7Z. Tel: 0272 735419.

ZX81 software, Forth, Ju-Calc, Flight Simulator, Fantasy games, toolkit, ZXDB, ZXAS, compiler, Hi-Res, over £60. Sell £30. Martin McAuley, WM7/B, University of Essex, Colchester.

Apple II colour-card plus UHF Modulator boxed, unused, cost £100, sell £60. Robocom Bit-Stik, new, boxed, cost £300 sell £170 or £220 for both. Tel: 01-886 2311 (anytime).

6-5K, Vic 20 cassette deck, T.V., books, magazines, £110. Software, Super Expander, joystick manual, cartridge, blank tapes boxed, five months guarantee. Cost me £440 sell for £220. Tel: Studley 3720.

Acorn Atom 12+12K, 3A PSU, Forth, Chess, Invaders, and many other games, £119 ono. K Powell, 18 Kings Avenue, Marcham, Oxon OX13 6QA. Tel: Frilford Heath 391492.

PCN Billboard

Wanted, pay £125 for disk drive; £140 paid for Grundig R/C TV; £50 paid for BBC disk interface. BBC software for swapping. Tel: Stephen, 01-524 1168.

Vic 20 + C2N + 16K RAM + six cartridges + four tapes + book, £350 ovno. David Blomfield, 57 Silver Street, Norwich NR3 4TT. Will deliver to nearest BR station.

Oric 48K computer, as new with £40 software and colour monitor/TV, £300 ono. Will split. Tel: Martin, 01-633 3771 (work), Orpington 72793 (home).

Acorn Atom 7K RAM 8K ROM, complete with PSU, manual, leads, book, £95. Tel: 01-452 5363.

Wanted, Jupiter Ace, Oric or Spectrum, any size memory, any condition (even non-working), but must be cheap. P Tan, 2 Ridley Road, London NW10 5UA. Tel: 01-961 6658.

Sharp PC-1500 Pocket Computer with 4K RAM plus printer/cassette interface, cost £350, sell £225. Mr Warhurst, 194 Southfields Avenue, Stanground, Peterborough. Tel: Peterborough (0733) 44701 (eves).

BBC Microcomputer. OS 1.2, version II Basic, Issue four board, fitted with disc interface and View word-processor ROM. Two months old, immaculate, £485. Tel: 051-644 6568.

BBC disc drive. Mitsubishi Slimline 80 track double-sided drive cased with data and power cables, one month old. Immaculate. £295. Tel: 051-644 6568 (Merseyside).

Apple II + full ASCII keyboard, £330; colour card, £40; Z80 card with CP/M Basic compiler and dBase II, £180; Videx 80-col card, £90. Tel: John, 66 23903 (days).

16K Oric I, all leads, manual, Flight Simulator cassette, two issues Oric Owner, boxed, condition as new, full guarantee, only £85 ono. Tel: Winch (0962) 64783 (anytime).

VDU & printer, uncased, B&W, 18MHz, 75µ IVP-P, £50; 32 column printer, parallel TRS-bus RS232C, 10 months' use, + connectors. Ideal for listings, £50. Both £80. Tel: D Spindrod, 021-378 1782.

BBC bits and pieces, BBC/NEC, 30hr Basic course and cassettes. All Beebugs to date. Acorn user, Nos 1-11, BBC Basic book; Software: Frogger, Hitch Hiker, Startrek and BBC Music, £30 the lot, or offers. Tel: 0963 250115.

Sharp PC1215 portable with cassette and printer in detachable module which includes charger. Extremely flexible machine with user definable keys, £140 ono. Tel: Glossop (045 74) 5530.

Bargain. Fully expand your Vic 20: motherboard + 16K + superexpander + Vicmon cartridge + £70 software including Matrix, Laser Zone, Whacky Waiters, Catcha Snatcha. Best offer over £100. Tel: 0203 416176.

Mattel Intellivision 23 cartridges: Tron, Pitfall, Star Strike, Dungeons and Dragons, Lock 'n Chase, Space Armada, Skiing, Boxing, Tennis, Basketball, etc. £280 ono. Tel: Pudsey 561760.

Vic20 + tape deck + Skramble + Frantic + Catcha Snatcha + Intro to Basic + nine other professional progs, all under a month old, £120. Tel: Gravesend (0474) 67326.

Oric I 48K software Xenon, Candyfloss, 3D Maze for sale. Tel: 01-445 5989 (eves).

Swap Bug Bytes' City Defence for any other BBC/Original. Two BBC books and Spectrum pocket book (offers), back issue magazines. Tel: Quorn 413590.

CBM Pet 32K(3032), dual disk (3040), printer (4022), cassette deck, Viscalc, rarely used, might split, £800 ono. Tel:

Jones, Sheffield (0742) 304982 (days), 661986 (after 7pm).

16K ZX81 with manual and leads, lots of software including Black Crystal, Asteroids, Scramble, etc. Nearly new, sell for £70 ono. Tel: Chertsey 65209.

For sale, BBCB, DFS, Teac slimline drive, Microvitec monitor plus loads of software, cassette, £850. Must sell. Keith, 45 Fairhaven Road, Widnes, Cheshire. Tel: 051-424 8853.

Atom fully expanded, BBC ROM fitted, leads, PSU and software. As new, £90. 7 Derwent Close, Elvington, York YO4 5AW. Tel: 090 485328.

BBC 32K Model A with 6522 chip, all leads and manuals, software including games and Lisp, £280. Tel: 061-773 8671.

Atari owner wishes to swap latest software including Shamus II, Necromancer, Pharaohs Curse, and Astro Chase for Preppie II or others. Tel: Milton Keynes (0908) 750948.

Spectrum 48K plus cassette recorder, manuals, books and software, must sell — moving. Worth over £200. Will sell for £100 ono. Tel: Harry, 01-727 6956 for details.

Dragon 32 with manual, joysticks, books, software, worth over £250; tape recorder, total value over £500, will sell £300 ono. Must sell — moving. Tel: Harry, 01-727 6956 for details.

Super ZX81, dk'tronics keyboard with numeric keypad and 16K RAM. Also switched video inverter and three books. Snip at £65. Tel: Mac, Keynsham 2120.

Lynx 48K, leads, manual, eight computer quality tapes, genuine reason for sale, hence bargain price of £175. Tel: 061-707 3716 (Manchester) after 6.30pm.

Vic Programmers Aid cartridge, four months old, very good condition, £25 ono. Tel: Ruislip 30168 (eves).

Atari cassettes, 13 games originals, £60, cost £350, will split for 1/3 cost. Also 410 cassette player, six months old, £30 ono. Tel: Broadstone 691306.

Pet 2001 8K with integral cassette drive, excellent Basic tutorial included along with many other program tapes, worth seeing, £270 ono. Tel: 01-889 3952.

Atari cassette software — Shamus, Time-warp, Escape from Perilous (32K), (graphic adventures). Galactic chase (Galaxian). Originals as new with documentation, £9.50 each. Tel: Mike, Bolton 593313.

For quick sale: remaining software after sale of Sharp MZ80A/K hardware, letters only, guaranteed bargains. Mr C Kennett, 17 Moseley Wood Way, Cookridge, Leeds 16 7HN, West Yorks.

T199/4A cassettes for adventure module, Adventureland, Mystery Funhouse, Ghost Town, Savage Island & Golden Voyage. Original packing, £10 each or swaps. Tel: 0501 70326.

Seikosha GP-100A printer, boxed as new, hardly used, suitable for any computer with parallel centronics interface, £160. Tony, 041-636 1239 (Glasgow).

ZX81 + 16K with leads and book, only £40. Also joystick and joystick interface with tape and book only £20. (0295) 720812, Alec.

TRS80 Model 132K + VDU + tape drive + TRS80 disk drive + Seikosha GP80 printer + compiler + assembler/editor + many games, £400. Tel: 01-555 9977.

Spectrum 16K, good condition £85, also DK'Tronics keyboard worth £45, very little used, £25. Software, Orbiter, Spectres, etc, worth £47, £25. Ben. Tel: Alfrinton (0323) 870201, 4pm-10pm.

Atari TV game, with Asteroids, Circus, Combat, Missile Command, Joysticks, Paddles etc, excellent condition, £80. Tel: 0667-52174.

Wanted 16K RAM pack for Sinclair ZX81. 01-969 3513.

Wanted: Atari disk drive and 48K Atari 800, must be in perfect working order, and cheap. Tel: 01-341-0464 (evenings).

Spectrum software — The Hobbit, Time Gate, Arcadia, Hungry Horace, Ground Attack, Cruising Reversi, cost £52.20, sell £25. 01-960-4388 after 7pm.

ZX81 (16K) complete with manual etc, perfect, Flight Sim and 3-D Defender, offers. M/C test tool offers. Tel: Bury St. Edmunds 705016.

UK101 8K beautifully cased + 110/600 baud, assembler, monitor tapes, KSR33 teletype £200. D Buckley, 142A Lynton Road, London W3. 01-211 3192 day 01-993 3123 eve.

Acetronic MPJ 2000 TV game for sale, including seven additional cartridges including Space War, Soccer, Shooting Gallery and Musical Games, good condition. Leeds: 665353.

Spectrum games wanted: I buy or exchange 16 or 48K programs — adventures, languages — Steve, Sheffield 666867.

CBM 4032, 32K RAM + programmers toolkit, cassette recorder, operating manuals, games, Pet Chess, Space Invaders, 18 months, good condition, original packing, £500 ono. Tel: Doncaster 0302-840630.

Byte, Kilobaud, DDJ, micro 6502 back issues wanted. American computer magazines in exchange. Smith, 84 Edenfield Gardens, Worcester Park, Surrey, KT4 7DY, (sac sales list).

Seikosha GP-100A printer, boxed as new, hardly used, suitable for any computer with parallel centronics interface, £160. Tel: Tony, 041-636 1239 (Glasgow).

Bored with your Spectrum games? Why not swap them with me — 16 and 48K — Tel: Steve, Sheffield 666867.

Wanted ZX81 1K will pay up to £110, also if ZX81 bought, then RAMpack wanted, will pay £10. Both must be in good condition. Tel: Bobby, Bradford (0274). Tel: 495882 after 5pm weekdays.

Arlon/Torch Vic 20 Expansion Unit with lid, £70. Super Expander cartridge, £25. Vic revealed, £5. Tel: 061-439 7716 from 5-7pm and ask for Simon.

Intellivision, five months old, hardly used, plus five games, £180, sell to buy BBC (B) micro. Tel: 01-889 9882 evenings.

ZX81 (16K) Kempston keyboard + Zon X sound unit + Spectrum extension board + £20 of software, worth £180, offers over £125. Tel: S Kenton, 660-6607, first come first served + manual etc.

Spectrum 48K, only weeks old, 11 months guarantee, software over £150 worth, includes Hobbit, Penetrator, Time Gate, Chess, Galaxians, Invaders, Defender, 3D-Tanx, Mazeman, Adventure, Planetoids, Ground Attack, etc, bargain. Tel: 01-590-8301.

Prestel Adaptor (Tantel numeric), as new, best cash offer, or swap for Spectrum 48K or similar computer. Tel: 048 67 (Brookwood) 4755, also ZX81 books.

ZX81 mains adaptor, suitable for printer use, only £5 exchange, Cox T.D.010 model engine unused collector's item £40. Borland, 51 Lovell Gardens, Watton, Norfolk IP25 6TX.

Commodore Pet 3008 32K RAM cassette drive, Basic 2 sound box and tons of software, both games and utilities. Cost £900, accept £500 ono. Tel: 01-803 4733.

Prestel adaptor (Tantel numeric), as new, best cash offer, or swap for Spectrum 48K or similar computer. Tel: 048 67 (Brookwood) 4755, also ZX81 books.

Atari 400/800 cartridge £20 or swap for assembler cartridge or good ROM. Tel: 0667 52174.

CRT GEC E4103/B/4 1in with data £5. D Buckley, 142 Lynton Road, West Acton, London W3. Tel: 01-993 3123 eve, 01-211 3192 day.

Laugh line

Our horsey Laughline in issue 20 had many of you champing at bit and inventing new 'GG' micros.

Close runner for the £20 prize was Richard Porter, of Croydon, Surrey, who thought Rosalind Bevan was telling Tony Clarke, managing director of Dragon Data: 'I found him outside the main gate. There's a man lying in the road next to a big pile of

armour.' (Don't worry . . . we had to think about it too . . .). And Helen Potter, of the Isle of Wight, reckoned Mr Clarke was thinking:

10 REM OPEN 1 I

20 ? "ICAGG"

30 END

But winning by a clear head was Christopher Green, from Norwich, who suggested that Mr Clarke was saying: "No Ms Bevan, I said I wanted an Epson printer, not an Epsom sprinter!"



Syntax Errors

SUM total

Routine Inquiries (PCN issue 22) got a bit stropky with a teeny fault in the documentation for Orbiter. The simple instruction to 'press ENTER' was omitted and confused a reader.

And guess what got left out of Max's answer? It should read: 'type CLEAR 25102, press Enter then LOAD "" CODE and press Enter.' Come back Silversoft — all is forgiven!

NEXT WEEK

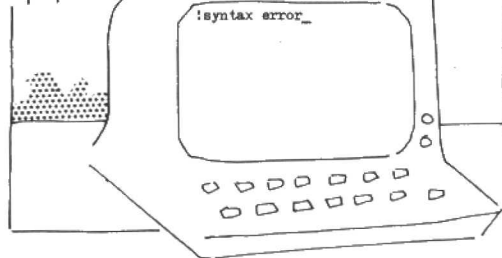
● Don't miss part one of the pull-out Micropaedia series on the Commodore 64 ● How to program adventure games ●

Pro-Test of the cheapest colour computer in the UK ● Software Pro-Test of Fifth on the Spectrum and T-Maker for the IBM PC ● Peripheral Pro-Tests look at a new digital tracer for the

Spectrum and compare printer values ● Gameplay tests new games for the Oric, Dragon, BBC, Commodore 64 and Spectrum ● PLUS all the regulars.

PAL2000

by Mollusc



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
8th ZX Microfair	August 20	Alexandra Palace, London	Mike Johnstone, 01-801 9172
Acorn User Exhibition	August 25-18	Cunard International Hotel, London	Computer Marketplace Ltd, 01-930 1612
Strathclyde Home Computer Fair	August 26-27	McLellan Galleries, Sauchiehall Street, Glasgow	Jarak Sales, 25 Dungavel Gdns, Silvertonhill, Hamilton, Scotland. 0698 457204
Computer Open Day	September 1	Draganora Hotel, Leeds	Tony Kaminiski, Couchmead Communications Ltd, 01-778 1102
Video, Audio and Computer Show	Sep 16-18	Bradford Exposition Centre	R. Cooper, J. Wood & Sons Ltd, Bradford 720014
Home Entertainment Show	Sep 17-25	Olympia, London	Montbuild Ltd, 01-486 1951
Computer Open Day Exhibition	September 22	Central Hotel, Glasgow	Couchmead Communications Ltd, 01-778 1102
Microcomputers in Business	Sep 27-29	Warwick University, Coventry	Peter Bubb, 01-892 4422
Personal Computer World Show	Sep 29-Oct 2	Barbican Centre, London	Montbuild Ltd, 01-486 1951
Computer Fair	Oct 2	The Sir Frederic Osborn School, Welwyn Garden City	R Brown
European Computer Trade Forum	Oct 4-7	NEC, Birmingham	Welwyn Garden City 23367
			Clapp & Poliak
			Europe Ltd, 01-747 3131

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
National Computer Business & Office Systems	Aug 16-19	Auckland, New Zealand	Trade & Industrial Exhibitions, 12 Heather Street, Parnell, PO Box 9682, Auckland
Personal Computers & Office Automation Systems Exhibition	Sep 5-8	Amsterdam, The Netherlands	RAI Gebouw BV, Europaplein 2, 1078 GZ, Amsterdam
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic 3205
International Peripheral Equipment & Software Exposition	Sep 13-15	Moscone Centre, Anaheim, USA	Cahners Exposition Group SA, 0483 38085
Gulf Computer Conference	Nov 22/23	Dubai International Trade Centre	Reed Conferences, Surrey House, Throwley Way, Sutton, Surrey. 01-643 8040

SOFTTEK

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**Monsters
in Hell**
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SPECTRUM



Robon
SPECTRUM



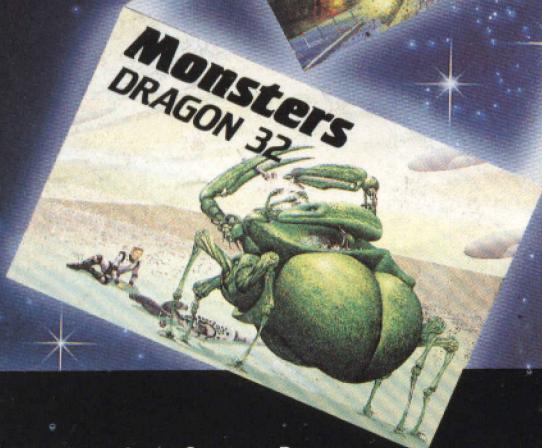
Megapede
SPECTRUM



Repulsar
SPECTRUM



Monsters
DRAGON 32



**WATCH THIS
SPACE**

**Games for
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DRAGON
BBC
CBM 64**

Coming Soon

Galaxians
ORIC



**Super
Meteors**
ORIC



Softek software for the Spectrum, Dragon and Oric should be available in most major outlets such as W. H. Smith, Lasky's, Spectrum and selected branches of Menzies as well as through our nationwide dealer network. Alternatively fill out this coupon and we'll rush you your Softek game by return of post!

All Softek software comes with a perpetual guarantee. Should it ever fail to load return it for a full refund. If the tape shows signs of physical damage then please enclose £1.50 to cover costs.



SOFTTEK SOFTWARE
12/13 HENRIETTA STREET, LONDON WC2
Tel: 01-240 1422

SPECTRUM GAMES:

OSTRON ☐ £5.95
FIREBIRDS ☐ £5.95
ROBON ☐ £5.95
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MEGAPEDA ☐ £5.95
MONSTERS ☐ £5.95
IN HELL ☐ £5.95

ORIC GAMES:

GALAXIANS ☐ £6.95
SUPER METEORS ☐ £6.95
DRAGON 32: ☐ £6.95
MONSTERS ☐ £6.95

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